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The Great Divide:  
Regional Inequality and Fiscal Policy

by William Gbohoui, W. Raphael Lam, and Victor Lledo

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I N T E R N A T I O N A L M O N E T A R Y F U N D

**IMF Working Paper**

Fiscal Affairs Department

**The Great Divide: Regional Inequality and Fiscal Policy**

**Prepared by William Gbohoui, W. Raphael Lam, and Victor Lledo<sup>1</sup>**

Authorized for distribution by Catherine Pattillo

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**Abstract.** Growing regional inequality within countries has raised the perception that “some places and people” are left behind. This has prompted a shift toward inward-looking policies and away from pro-growth reforms. This paper presents novel stylized facts on regional inequality for OECD countries. It shows that regional disparity in per-capita GDP is large (even after adjusting for regional price differences), persistent, and widening over time. The paper also finds that rising nationwide income inequality is associated with both rising within-region income inequality and widening average income across regions. The rise in inequality is related to declining incentives for interregional labor mobility, especially for poor households in lagging regions, which are estimated to reduce by as much as one-third in the United States. Against these facts, the paper proposes a framework to identify whether, how and by whom fiscal policies can be used to tackle regional inequality. It outlines conditions under which those policies should be spatially-targeted and illustrates how they can be complementary to conventional means-testing methods in mitigating income inequality.

JEL Classification Numbers: D63, E62, H20, H77, R12, R23

Keywords: Regional inequality;fiscal redistribution; mobility; intergovernmental relations

Author’s E-Mail Address: [wgbohoui@imf.org](mailto:wgbohoui@imf.org); [wlam@imf.org](mailto:wlam@imf.org); [vlledo@imf.org](mailto:vlledo@imf.org)

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*"Many regions have been marginalized in the rich world" The Economist, October 2017*

## I. INTRODUCTION

Regional perspectives have taken a back seat in the discussion about inequality. Policy debates have focused on nationwide inequality of income and opportunity across individuals and not on inequality between regions within a country. The literature has shown that high and rising nationwide inequality has been negatively associated with growth, macroeconomic stability, and pro-growth reforms (Easterly, 2007; Ostry, Berg, and Tsangarides, 2014, Dabla-Norris and others, 2015) and discussed how fiscal policies can mitigate inequality (IMF 2017). Regional perspectives have not featured prominently, as regional inequality has been largely seen as a natural part of economic development. Regional inequality is expected to initially rise when economies grow, but would eventually decline through the mobility of labor and capital within national borders, leading regional incomes to converge (Barro and Sala-i-Martin 1991). As such, regional inequality was not expected to exert lasting impact on nationwide inequality and the macroeconomy.

Globalization and the global financial crisis have brought regional inequality to the forefront. As growth shifted jobs and industries on the map, gains were not well shared—raising the perception that some "places and people" have been left behind, including some formerly prosperous regions in advanced economies (Autor, Dorn, and Hanson 2013; Nunn, Parsons, and Shambourg 2018). The trend of rising regional inequality began in 1980s-1990s (OECD 2016; Roses and Wolf 2018) and has turned more pronounced in the years following the global financial crisis, with already-prosperous places being less affected and even seeing more robust growth and job creation. Meanwhile, many regions—urban and rural alike—have lagged behind, widening the gaps with prosperous regions (Moretti 2012). It is important to note, however, that these studies showing rising disparity of income across regions did not adjust for differences of regional prices, which usually vary significantly across regions and could lead to mis-measurement of regional disparity.

Recent politics and new evidence further rooted regional inequality in the policy debate. The growing populism prompted a shift toward more inward-looking policies and put many pro-growth reforms at risk (The Economist 2016; Yglesias 2017). Emerging evidence shows that regional inequality reflects a decline of internal factor mobility (Ganong and Shoag 2017) and may contribute to weaker long-term growth and growing populist policies if left unaddressed (OECD 2016; Bouchet and Parilla 2017, Winkler 2018). On the policy front, the effectiveness of conventional spatially-blind fiscal policies in addressing rising inequality and stagnant regional growth have raised questions as to whether spatially-targeted policies should be part of policy tools (Galbraith and Garcilazo 2010; Gill 2010; Austin, Glaeser, and Summers 2018).

This paper contributes to the debate on regional inequality and fiscal policies on multiple fronts. First, the paper illustrates novel stylized facts on regional inequality for a sample of OECD countries. Second, it proposes a conceptual framework, grounded in the stylized facts, that identifies whether, how, and by whom fiscal policies could be used to mitigate regional inequality. Lastly, the paper also illustrates the conditions in which spatial considerations can complement national policies to mitigate income inequality.

This paper identifies several novel facts. First, our analysis overcomes a limitation in previous studies by adjusting for regional price differences and finds that the disparity of income across

region remains large. At the same time, regional disparity has been persistent. Lagging regions have about a 70 percent chance to remain behind, and tend to grow slower in income and employment, suggesting signs of regional divergence. Second, our analysis links the two branches of studies on regional disparity and inequality of income distribution. We find that countries with greater regional disparity of income levels tend to have greater contributions of the between-region component to the rise of nationwide income inequality. Third, rising disparity of income across regions is related to falling labor mobility. For example, the incentives for interstate migration are estimated to have declined by as much as one-third in the United States over the past decade.

The proposed framework aims to guide fiscal policy to tackle regional inequality. It builds on the IMF's operational guidelines for the analysis of inequality (IMF 2018). The first stage is to assess whether regional inequality is macro-critical and its main determinants. Then if regional inequality is deemed necessary to address, policymakers need to decide on appropriate strategies and policies. The final stage is to determine which government levels should design and implement policies. The framework aims to help inform the unsettled debate of whether, when, and by whom spatially-targeted policy should be used to tackle regional inequality.<sup>2</sup> Spatial considerations are likely more important in deciding the fiscal strategies when targeted regions are populated by a dense mass of less-mobile, disadvantaged individuals, and when targeting those individuals through spatially-blind means-testing is less effective and costly.

The paper argues that regional inequality matters and fiscal policies that account for spatial dimensions can be complementary to existing policies to mitigate inequality. The rest of the paper is organized as follows. Section II illustrates the trends on regional inequality and discusses their key driving forces. Section III outlines a conceptual framework in tackling regional inequality. Section IV illustrates an exercise on how spatial considerations can be complementary to current means-testing in mitigating inequality. Section V concludes.

## II. DYNAMICS AND DRIVING FORCES OF REGIONAL INEQUALITY

*"It is urgent to address regional divergence: once you become aware of its magnitude, it is hard to ignore how it pervades our politics as well as our economics." Financial Times, November 2018.*

Regional inequality in this paper is measured across two dimensions: between- and within-region inequality. In this paper, regions refer to state or provinces, as defined in the Large Territory Regions (TL2) in OECD classification.<sup>3</sup> The between-region inequality in the paper refers to disparities across regions on measures such as real per-capita GDP or disposable household income, as well as unemployment rates and nonworking population. An example would be differences of average per-capita GDP between Missouri and New Jersey. The within-region inequality refers to the inequality in household income distribution in a region.<sup>4</sup> An example

<sup>2</sup> Some call for more proactive policies to help hardest-hit regions, while others favor less interventions when resources are put to most productive uses (World Bank 2009 and OECD 2009, 2016).

<sup>3</sup> OECD (2018) territorial definition: <https://www.oecd.org/regional/regional-policy/website-defining-regions.pdf>

<sup>4</sup> When measuring income inequality within regions, standard measures use Gini-coefficient or generalized entropy class measures (e.g., Theil index) on market income before tax and transfers or disposable income after

(continued...)

would be how household income is distributed in Missouri and in New Jersey. This paper focuses on the 1990-2016 sample period.

The rest of the section develops some stylized facts focusing on the dynamics of regional inequality across several dimensions, as well as identifying potential driving forces that are closely related to regional inequality.

## A. Dynamics of Regional Inequality

### 1. Regional disparity (between-inequality) in income levels has been large even after adjusting for regional price differences.

Previous studies (Bartolini 2015; Iammarino, Rodriguez-Pose, and Storper 2018) that find large regional disparities often do not adjust for differences in regional prices. Such price differences could be significant in some countries. For example, the same income in dollar terms can buy more than 1.3 times more goods and services in Missouri than in New Jersey. To account for that, our analysis adjusts for living cost differences (including housing cost) when measuring regional disparity of per-capita GDP, based on available data and the Luxemburg Income Surveys (LIS).<sup>5</sup> For countries without official statistics on regional prices, adjustments are made using the housing costs (rental payment and implicit cost if households own the dwellings) from LIS income surveys to proxy for price differences of household consumption.<sup>6</sup>

Adjusting for regional prices, regional disparity remains sizeable with per-capita GDP in the top quartile regions 1.3 times higher than in the bottom quartile regions (slightly less than 1½ times before regional price adjustment) on average for OECD countries during 2010-14 ([Figure 1 bottom left panel](#)). It is sometimes more severe than cross-country differences in OECD countries.

The difference is also large for regional disparity of unemployment rates, an indicator less sensitive to prices. On average, the difference of unemployment rates between the regions of 90<sup>th</sup> percentile and 10<sup>th</sup> percentile was 5.6 percent on average across OECD countries during 1990-2016. The difference in some countries such as Slovakia, Italy, Spain and Belgium are in double-digit levels ([Figure 1 bottom right panel](#)), much larger than the cross-country differences across OECD economies.

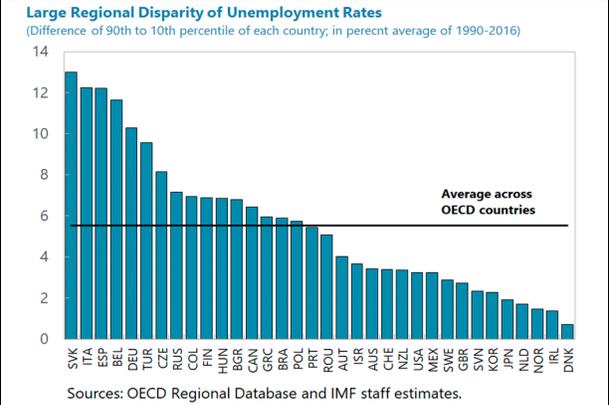
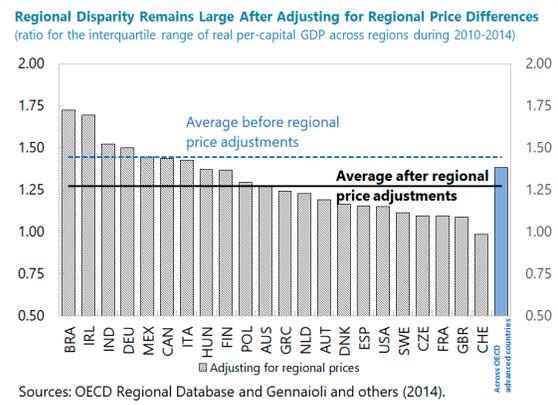
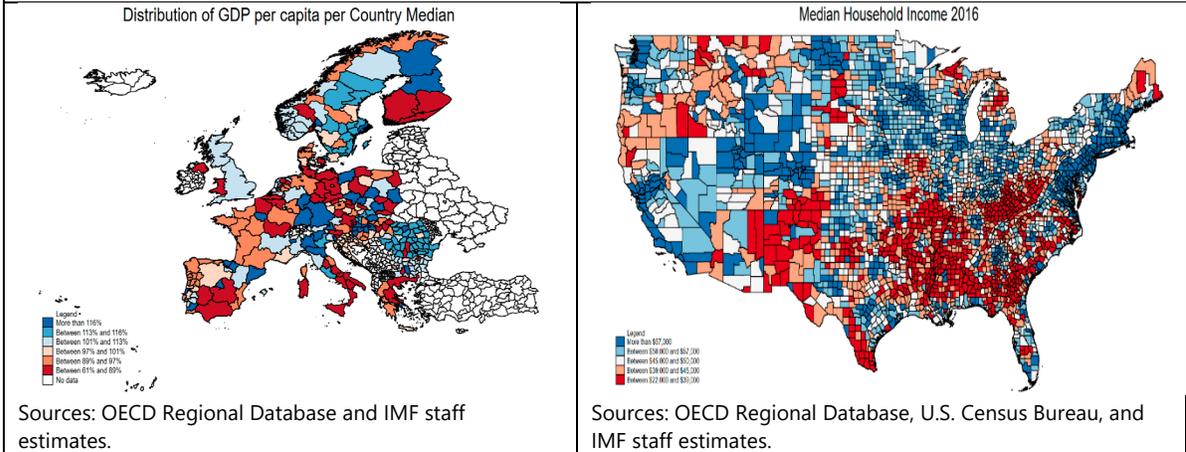
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taxes and transfers. Indicators such as coefficient of variation and percentile differences (75<sup>th</sup>-25<sup>th</sup> or 90<sup>th</sup>-10<sup>th</sup>) are often used to measure regional disparities.

<sup>5</sup> The LIS (<https://www.lisdatacenter.org/>) contains further details on the data availability, limitations, and revisions.

<sup>6</sup> Countries such as the United States publish annual regional price levels from the Bureau of Economic Analysis (BEA). For countries that do not publish regional prices, adjustments are made using the housing costs from LIS household income surveys. The estimates assume households in different regions face same prices in tradable goods, while non-tradable good prices are proxied by regional housing cost observed in the income surveys based on Gennaioli, La Porta, De Silanes, and Shleifer (2014). They also assume non-tradable goods account for 30 percent of the aggregate consumption bundle. A limitation is that it excludes differences of prices for tradable goods that account for a majority share of consumption basket.

**Figure 1. Large Disparity on Income Levels and Unemployment Rates across Regions in OECD Countries**



**Table 1. Regional Inequality of Income and Selected Social Outcomes (2000-16)**

	<i>Regional dispersion (75th-25th percentile)</i>				
	<i>Regional level</i>				
<i>Correlation with:</i>	<i>per-capita real GDP</i>	<i>Disposable household income</i>	<i>per-capita real GDP</i>	<i>Disposable household income</i>	<i>Nonworking population</i>
<b>Life expectancy (at birth)</b>	0.4596*	0.5990*	-0.2345*	-0.1133*	0.0932*
<b>Health access</b>	0.2266*	0.1324*	-0.1748*	-0.1875*	-0.1714*
<b>Education attainment (secondary level)</b>	0.5542*	0.6517*	-0.5758*	-0.5370*	-0.0348

\* denotes 5 percent statistical significance level.  
Sources: OECD Regional Database and IMF staff estimates.

Regional disparity indicators are often closely linked. Regions with low per-capita GDP levels, disposable household income or higher unemployment rate also have lower health access and education attainment. This strong correlation is also observed at the country level, in which countries with higher regional disparity in income and unemployment rate also tend to be those with weaker social outcomes (Table 1). The negative correlation ranged from -0.07 to -0.19 for

health access and -0.34 to -0.58 for education attainment, both statistically significant at the 5 percent level.<sup>7</sup> This reinforces the perception that “some people and places” are left behind.

## **2. The between-inequality on income has also been persistent and widened over time, particularly after the global financial crisis.**

The rising regional disparity of per-capita GDP beginning in the 1980s (Roses and Wolf 2018) has intensified during the global financial crisis. Regional disparities in household income and unemployment rates have also widened, particularly after the global financial crisis ([Figure 2 top left and right panels](#)). Regional conditional convergence—commonly observed during 1980s and 1990s (Iammarino and others 2018)—has stalled in many OECD countries. Our analysis separates the sample of regions into two groups: lagging regions are defined as those with unemployment rates above the 75<sup>th</sup> percentile in the nationwide distribution, while leading regions are those with unemployment rates below the 25<sup>th</sup> percentile of the same nationwide distribution. Instead of catching up, lagging regions tend to grow slower in per-capita GDP, household income, and employment, both in the full sample and after the global financial crisis ([Figure 2 bottom left panel](#); [Table 2](#)). Employment growth in the lagging regions was about one-third that of the leading regions during 2000-16. Real per-capita GDP growth was lower by about 1 percentage point over a 3-year horizon in lagging relative to leading regions.<sup>8</sup> Similarly, growth of disposable household income was lower in lagging regions than in leading regions. Such regional differences were statistically significant at 5 percent confidence levels.

The evolving trend of regional disparity differs across OECD countries. Such dynamics broadly fall into three groups. First, in a few countries (e.g., France, Greece, Italy, and Spain), the disparity has increased and remained larger than that before the global financial crisis, although it has narrowed from the peak as the economy picked up. The second group (e.g., Canada, United States, and Norway) has seen rising regional disparity during the global financial crisis but disparity across regions has scaled back to pre-2007 levels as the economy recovered. The third group, which includes Germany and Finland, continued to see a converging trend on unemployment rates across regions without being much affected by the global financial crisis, although the regional disparity of disposable income has not converged as much ([Appendix Figure A.1](#)).

Regional inequality is also highly persistent. The probability of a lagging region remaining lagging in the following year is high at 70 percent for the average OECD country and over 80 percent in Italy, New Zealand, and Canada ([Figure 2 bottom right panel](#)). This implies that lagging

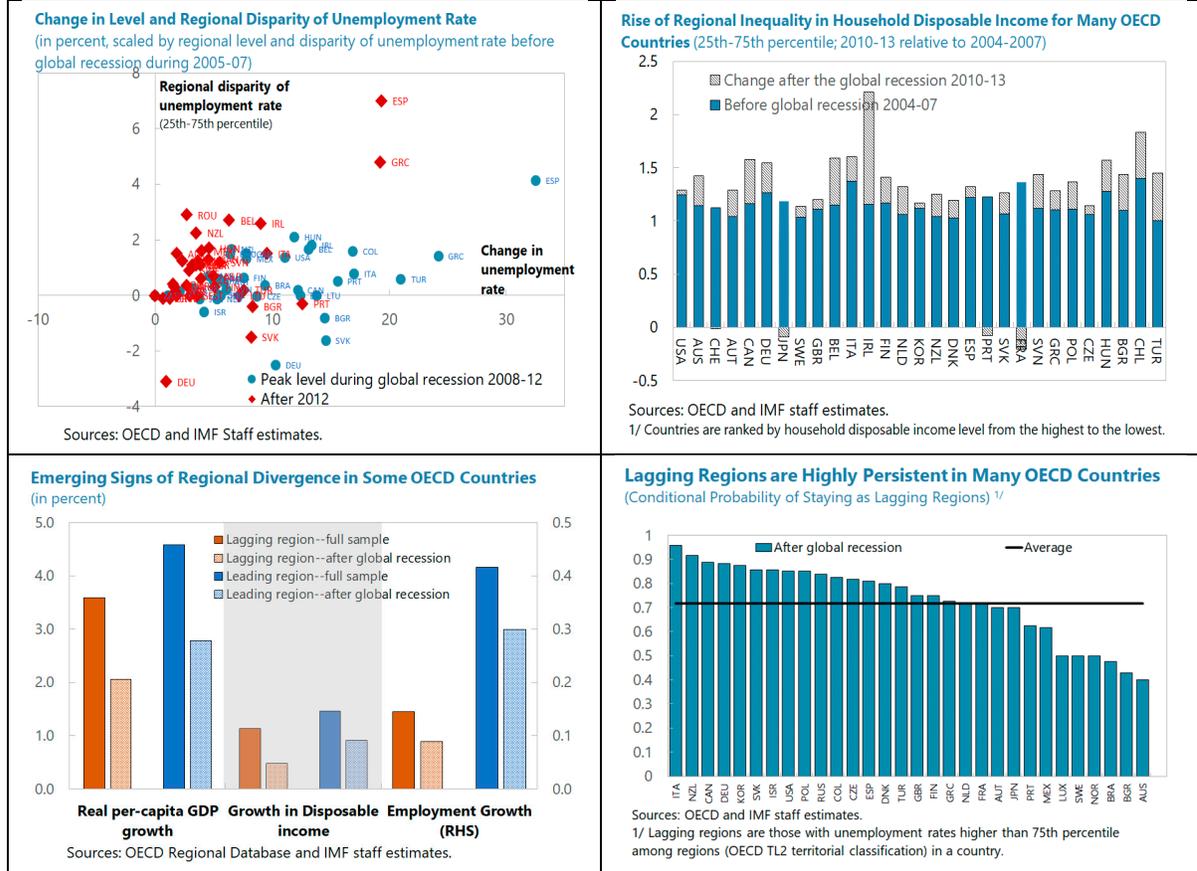
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<sup>7</sup> Life expectancy (at birth) has a positive but small correlation with regional unemployment rate (level and 75<sup>th</sup> to 25<sup>th</sup> percentile dispersion). The positive correlation could be related to relatively homogeneous access for health emergency cases independent of unemployment status. Some studies find that less-developed regions have lower education and health access (OECD 2016; Brezzi and Luongo 2016; Fischer 2017). Table 1 not only confirms such findings but also demonstrates the regional inequality at the country level is also related to country-level education and health access levels.

<sup>8</sup> Slicing the region classification differently, the OECDs also find that the GDP growth rates were on average lower in predominantly rural regions than predominantly urban regions in over two-thirds (18 out of 24) of OECD countries, while regions whose per-capita GDP declined over the last decade—such as Greece, Italy, and Spain—have shown weaker in productivity gains and labor utilization rates (OECD 2016).

regions have a high likelihood of staying lagged instead of gradually catching up to the more prosperous regions in the country.

**Figure 2. Rising Regional Disparity of Unemployment Rate in Many OECD Countries**



**Table 2. Differences Between Lagging and Leading Regions<sup>1/</sup>**

	(in percent and in annual frequency, unless otherwise stated)						
	Real per-capita GDP growth		Growth in Disposable income	Labor market indicators		Income inequality (Gini-coefficient)	
	3-year cumulative	Annual average		Employment growth	Unemployment rate	Before tax and transfer	After tax and transfer
<b>Full-sample (2000-16)</b>							
Lagging regions	3.58	1.83	1.13	0.16	11.66	0.45	0.33
Leading regions	4.58	2.14	1.46	0.42	5.46	0.42	0.31
Statistical significance for the difference <sup>2/</sup>	***	**	*	***	***	**	*
<b>Before global recession (2000-07)</b>							
Lagging regions	7.01	3.58	1.75	0.40	11.51	0.43	0.32
Leading regions	7.97	3.85	2.14	0.77	5.05	0.41	0.31
Statistical significance for the difference		*	*	***	***		
<b>After global recession (2009-16)</b>							
Lagging regions	2.06	0.86	0.48	0.09	11.84	0.47	0.34
Leading regions	2.78	1.17	0.91	0.30	5.80	0.43	0.31
Statistical significance for the difference	***	***	*	***	***	***	**

Sources: IMF staff estimates and OECD Regional database.

1/ Lagging regions are those regions with unemployment rates higher than 75-percentile in the country.

2/ \*\*\*, \*\*, \* denote statistical significance at 1, 5, and 10 percent levels.

In sum, these findings suggest that the between-region inequality with respect to income level has been large, persistent, and widening over the global financial crisis, underscoring the importance of considering regional dimensions in the discussion of inequality. Now we turn to the stylized facts on the within-region inequality, which refers to the inequality of income distribution in a region within the country.

### **3. The within-region inequality has risen over the past decade and accounts for most of the nationwide income inequality, but its contribution has declined.**

Nationwide income inequality has steadily risen across OECD countries over the last decade by about 0.03 Gini points on average (IMF 2017). The share of emerging market economies with a significant increase in Gini coefficient is higher than that in the advanced countries (IMF 2017). The rising trend remains even after adjusting for regional price differences and housing cost. In the case of the United States, for example, inequality on disposable income has risen by 0.02 Gini points (from 0.37 to 0.39) over the last decade. Adjusting for regional prices and housing cost across U.S. states, income inequality would be slightly lower by 0.01 Gini points but without affecting the rising trend (Figure 3 top left panel). This is partly because housing prices are higher in rich regions and low-income households spend relatively more on housing.

The rising nationwide trend in income inequality was also mirrored in many OECD regions. For example, in countries such as Australia, Germany, Spain, and the United States, where income inequality rose more rapidly, about two-thirds of regions have recorded a rise in income inequality (Figure 3 top right panel). In addition, regions with initial higher income inequality recorded a higher rise in Gini points over the last decade. Income inequality in lagging regions has also been higher than that in leading regions (Figure 3 bottom left panel). The difference is statistically significant after the global financial crisis.

The nationwide income inequality can be decomposed into between-region income inequality (how average income distribution differs across regions) and within-region income inequality (how income is distributed among households in each region). In advanced OECD countries, the within-region inequality accounts for most of the nationwide income inequality (about 90 percent), but its contribution has declined by about 5-10 percent. The small between-component across regions in the nationwide income inequality is consistent with findings of large disparities of income across regions (Goesling 2001). It is because the between-region component has increased faster than the within-region component, and it is increasingly contributing to the nationwide income inequality. Consistent with the findings on regional disparities above, countries with greater regional disparity on income levels tend to have higher contributions of between-region component of income inequality to the rise of nationwide inequality (Figure 3 bottom right panel).



The panel analysis uses the OECD Fiscal Decentralization database, the OECD regional database, and the OECD subnational government finance.<sup>9</sup> The baseline specification is:

$$Y_{it} = \alpha + \beta FD_{it} + \gamma X_{it} + \mu_i + \varepsilon_{it}$$

where the subscript  $i$  indicates the country, and  $t$  refers to the year.  $Y$  refers to a measure of regional disparity of income;  $FD$  corresponds to the different fiscal decentralization indicators, considered one at a time. The matrix  $X$  represents a set of explanatory and control variables which include labor mobility, population density, aggregate growth, and controls for industry structure;  $\mu$  is the unobserved individual country effect and  $\varepsilon$  is the error term.

Our baseline uses the real per-capita GDP (USD PPP adjusted) as a measure of regional income levels for international comparison.<sup>10</sup> The disparity uses the top-bottom decile ratio (p90-p10) of real per-capita GDP as a measure of regional disparity. The ratio is mean independent, less sensitive to outliers, and invariant to the number of regions. However, other measures, such as the (weighted) coefficient of variation and the 25th-75th percentile (Appendix B), are also used as a robustness check and results are similar.

Fiscal decentralization measures include the subnational government share of revenue, expenditure, personal income tax, and debt in general government aggregates. In addition, we also use the vertical fiscal imbalance—an indicator of the share of spending not financed through own resources—and transfer dependency from the central government to assess the extent of fiscal decentralization. The vector of explanatory variables contains the level of real GDP per capita and its squared term (capturing potential nonlinear effects), GDP growth rate, the share of gross valued added in manufacturing sectors and in the energy sector, the population density, the net migration rate, the unemployment disparity across regions, and the availability of social services.

The theoretical literature suggests a tradeoff between fiscal decentralization and regional disparities. On one side, where subnational governments (SNGs) are more autonomous and accountable to the local electorate, greater tax and spending decentralization would tend to reduce regional disparities by allowing SNGs in lagging regions to better mobilize revenue and target spending to close the efficiency gaps and catch up with leading regions (Rodriguez-Pose and Ezcurra 2010). On the other side, greater fiscal decentralization may increase tax competition across regional SNGs and generate a ‘race to the bottom’ with inefficiently low tax rates and lower revenue. It may also lead to diseconomies of scale and raise the costs of providing goods and services (disproportionately in lagging regions) thus increasing regional disparities (Wilson 2015). Higher transfer dependency and vertical imbalances would, on one side, increase regional disparities by constraining the capacity and incentives of lagging SNGs to catch up with leading counterparts. However, endogeneity problems could arise from reverse causality because higher regional disparities could prompt policymakers to decentralize policies toward the subnational

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<sup>9</sup> The links to OECD are: [https://stats.oecd.org/Index.aspx?DataSetCode=REGION\\_DEMOGR](https://stats.oecd.org/Index.aspx?DataSetCode=REGION_DEMOGR) and <https://stats.oecd.org/Index.aspx?DataSetCode=SNFG>.

<sup>10</sup> Shankar and Shah (2003) provides a review of different measures of inequality, including the maximum to minimum ratio, percentile differences, and coefficient of variation. The max-min ratio is sensitive to the presence of outliers, while the unweighted (weighed) coefficient of variation would depend on the number of regions (the population weight in regions).

governments. On the other side, they could help equalize fiscal resources necessary for lagging regions to achieve minimum standards in provision of subnational goods and services that are conducive to regional convergence (Bartolini and others 2016).

Empirical results from the panel analysis show that key determinants of per capita GDP regional disparity include labor mobility, economic development, regional population density, and the degree of fiscal decentralization, accounting for the endogeneity arising from reverse causality (Appendix B). Out of these explanatory variables, population density and labor mobility are the most important factors in explaining disparity across regions.

- *Labor mobility.* Higher net regional migration flows—a proxy for labor mobility—help to mitigate regional disparity of real per-capita GDP. For instance, a 1 standard deviation increase in net migration, a proxy of labor mobility, is statistically significant in reducing regional disparity by 4 percentage points as flexible labor mobility ensures more efficient resource allocation (Table 3 and Appendix B Table B1-B3). For example, in the United States, a growing literature has found that the declining U.S. interregional labor mobility is associated with barriers from rising housing costs, jobs mismatch from technology and globalization, and the inability to attract talents to lagging regions (Kaplan and Schulhofer-Wohl 2015; Bayoumi and Barkema, forthcoming; Autor, Dorn, and Hansen 2013; Hsieh and Moretti 2015).<sup>11</sup> The panel results suggest that labor mobility also affect the disparity of regional incomes for OECD countries beyond the United States.
- *Economic development,* measured by the country per-capita GDP level, shows a statistically significant inverted-U relationship with regional disparity, similar to a Kuznet’s curve, indicating inequality first rises and later decreases as economic development takes hold. This could happen when capital and skilled labor are concentrated in a few regions in a country and those regions may have faster productivity gains than the rest of the regions in the country. This could first raise disparity across regions. As the economy further develops, higher wages and declining marginal agglomeration benefits could lead to reallocation of capital and labor to less developed regions. Together with the knowledge spillover effects, the reallocation could lead to regional convergence and therefore reduce disparity across regions.
- *Population density.* Countries where the regional variation of population density is high tend to have higher regional disparity on per-capita GDP, suggesting a positive income effect of agglomeration forces.
- *Fiscal decentralization.* Our empirical results extend previous studies (Lessman and Siedel 2017; Bartolini and others 2016) by separating the potential different effects of fiscal decentralization according to the intergovernmental structure. Greater revenue and expenditure decentralization reduces regional disparity in federal countries where higher accountability to local electorate and greater institutional capacity allow autonomous regional governments to mobilize more revenue and to better target spending to reflect local

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<sup>11</sup> Rising housing costs have discouraged low-skilled workers to move from lagging to leading regions. Lower average wages in lagging regions also discourage high-skilled workers to migrate in.

(continued...)

preferences (Figure 4 and Table 4).<sup>12</sup> For unitary countries, the effects are opposite, possibly because SNGs are expected to implement pre-set revenue and spending policies from the central government with limited scope to match local preferences. Finally, the results also show that higher vertical fiscal imbalances contribute to greater regional inequality in both unitary and federal countries, pointing to the need to achieve a balanced fiscal structure to maximize efficiency gains (optimal vertical gap) and adequate resources to mitigate unfunded mandates (vertical fiscal imbalances) (Eyraud and Boadway 2018).<sup>13</sup>

**Table B.2. Key Determinants of Regional Inequality**

Dependent variable: Regional disparity of per-capita GDP (90th-10th percentile)						
Explanatory variables	Specifications					
	1	2	3	4	5	6
log (Per Capita GDP)	16.62* (9.840)	20.23*** (7.118)	4.389 (9.452)	21.69** (9.172)	21.41*** (7.446)	22.47** (9.129)
(log(Per Capita GDP)) <sup>2</sup>	-0.780 (0.484)	-0.961*** (0.349)	-0.170 (0.469)	-1.032** (0.450)	-1.018*** (0.364)	-1.069** (0.448)
GDP Growth	-0.00813** (0.00400)	-0.00739** (0.00346)	-0.00521 (0.00339)	-0.00783** (0.00343)	-0.00782** (0.00338)	-0.00607 (0.00375)
Population density	-0.00938** (0.00456)	-0.00841* (0.00445)	-0.0143*** (0.00433)	-0.00806* (0.00469)	-0.00807* (0.00457)	-0.00811* (0.00460)
Gross value-added of resource sector	0.00979 (0.00736)	0.00647 (0.00509)	0.0384*** (0.0117)	0.0121 (0.00744)	0.0131 (0.00807)	0.00980 (0.00760)
Unemployment disparity <sup>1</sup>	0.0320** (0.0148)	0.0244*** (0.00864)	0.0607*** (0.0120)	0.0235* (0.0135)	0.0230** (0.0104)	0.0220 (0.0140)
Net migration rate	-0.336 (0.209)	-0.345* (0.205)	-0.0336 (0.179)	-0.374* (0.210)	-0.318 (0.205)	-0.358 (0.220)
Physicians per 1000 population	-0.0425** (0.0191)	-0.0254 (0.0161)	-0.0577* (0.0324)	-0.0166 (0.0196)	-0.0181 (0.0186)	-0.0189 (0.0184)
Unitary X Revenue share	0.00981** (0.00473)					
Federal X Revenue share	-0.0128** (0.00545)					
Unitary X Expenditure share		0.0103** (0.00459)				
Federal X Expenditure share		-0.00275 (0.00404)				
Unitary X Debt share			0.0452*** (0.00828)			
Federal X Debt share			0.0306** (0.0134)			
Unitary X Transfer Dependency (spending)				-0.0301* (0.0179)		
Federal X Transfer Dependency (spending)				0.00477*** (0.00118)		
Unitary X Transfer Dependency (revenue)					-0.0271* (0.0164)	
Federal X Transfer Dependency (revenue)					0.00391*** (0.00114)	
Unitary X Vertical fiscal imbalance						0.498* (0.300)
Federal X Vertical fiscal imbalance						0.0230 (0.174)
Year Fixed Effects	NO	NO	NO	NO	NO	NO
Observations	160	160	191	160	159	160
R-squared	0.6083	0.6166	0.5459	0.607	0.6055	0.6204
Number of countries	14	14	18	14	14	14

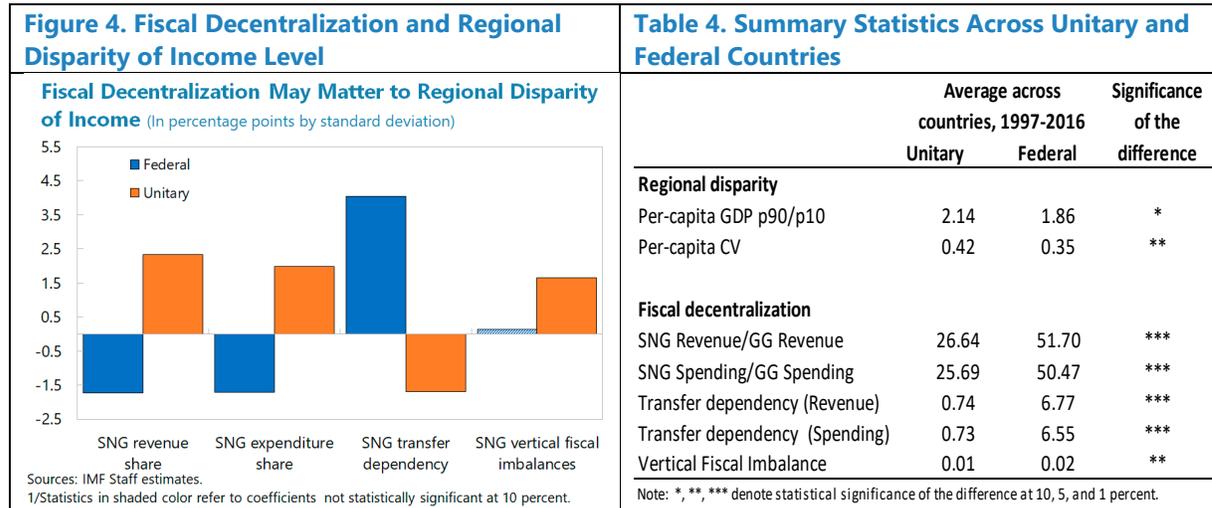
Note: FE2SLS estimation; instruments are similar to those used in the regressions presented in the main test. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

<sup>12</sup> Our results are consistent to Shankar and Shah (2003) who concluded that federal countries restrain regional inequalities more successfully than unitary countries, as well as to recent empirical studies that show greater fiscal decentralization could mitigate regional inequality under some conditions (Caroline-Antonia and others 2014, Bartolini and others 2016; Goerl and Seiferling 2014).

<sup>13</sup> These results are subject to caveats that the fiscal decentralization measures (SNGs' share of general government) may not fully capture the actual degree of autonomy of SNGs.

(continued...)

Our empirical results also indicate that control variables such as the availability of social services (proxied by number of physicians per thousand population) and the efficiency of labor allocation across regions, proxied by unemployment gaps, have the expected signs. However, we do not find a strong correlation between regional inequality and industrial structure—proxied by valued-added share of manufacturing in regions, while the effects of the resources sector are only significant in some specifications. A robustness check points to similar results, regardless of using alternative indicators of regional disparity of income or different specifications.<sup>14</sup>



### ***Labor Mobility and Regional Inequality***

As the panel analysis points to labor mobility as a key determinant of regional inequality, the paper further explores this using the micro dataset of household surveys for 13 OECD countries available in LIS. Since households' interregional movements within a country are not directly observed, we estimate the returns from interregional migration to infer the mobility pattern across regions and by income classes—essentially capturing the incentives of households to move across regions in a country. The available data from the OECD Regional Database include only the aggregate gross and net inflows of labor at regional levels but not the flows of each origin and destination region.<sup>15</sup>

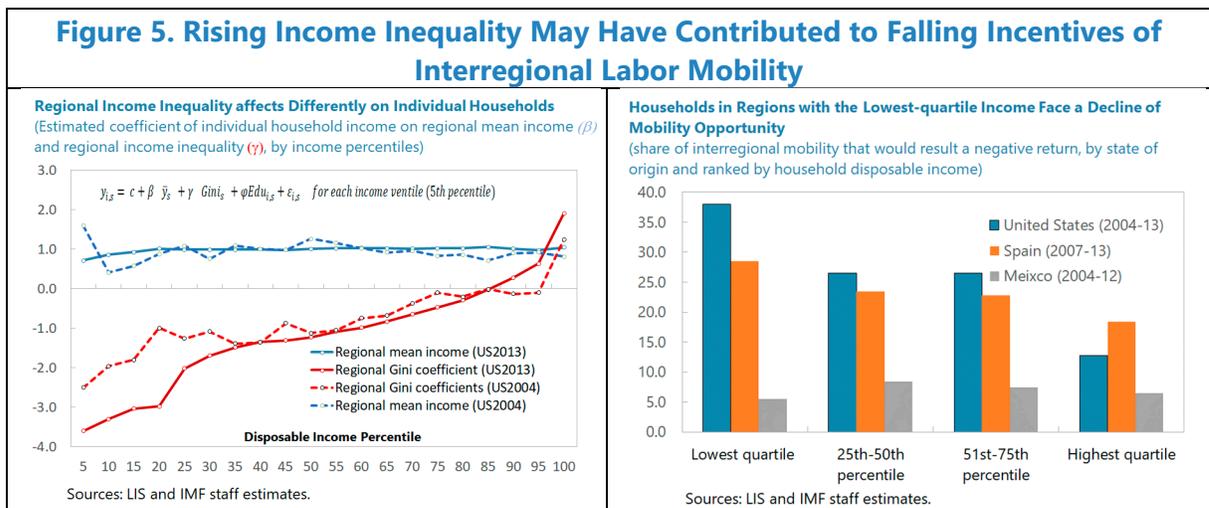
Households are likely to relocate if returns, measured in terms of income difference between the origin and the destination regions, are positive and rise over time. The difference of regional income is one of the important factors in the relocation decision. As such, labor mobility patterns can be inferred by examining how the returns from relocation change over time and if rising regional price differences and income inequality contribute to such changes. The approach follows two steps. First, we extend Milanovic (2015) to estimate household income based on regional

<sup>14</sup> A growing empirical literature tries to examine the determinants of rising regional inequality, relying on cross-country and region panels (Bartolini, Stossberg, and Blochliger 2016; Lessmann and Siedel 2017). However, the explanatory factors can affect each other and give rise to endogeneity problems.

<sup>15</sup> The net migration flows fell by 0.06 percent of the state population over the last decade. The interregional migration refers to households moving from one region to another region within the same country, which does not represent the inflow and outflow of migrations from and to other countries (see Ramirez, Liebig, Thoreau, and Veneri 2018 for findings on cross-country migrations in OECD countries).

average income and its distribution by income classes for each of the 13 OECD countries (Appendix C). Second, we use the estimated coefficients to calculate the returns to interregional migration for households across different income classes, accounting for differences in regional prices. The estimated returns are compared across different vintages (cross sections) of household income surveys for these OECD countries to assess how returns have changed over vintages during the last decade.

When a household moves from its resident region to other regions in a country, some destination regions generate higher income (positive returns), while other destination regions generate lower income (negative returns). Mobility returns depend on differences in the average regional income level, regional income inequality, and regional price differences proxied by housing costs. These driving forces have different impacts across regions and income classes because households spend different fractions of income on housing and housing costs have risen more rapidly in more prosperous regions.



Our estimates show that the average regional income difference between the origin and destination states is a key determinant for mobility returns across all income classes. But income inequality affects labor mobility adversely for low-income households only. For example, in the United States, for the same difference in average state income level between the origin and destination regions, low-income households would benefit less if the destination regional income distribution is more unequal. A one Gini point increase would reduce household income by 2.9 percent for low-income households in the lowest income quintile in 2013 (Figure 5 left chart red solid line). On the other hand, a rise in income inequality would benefit the high-income households by 0.9 percent for the same average state income level.<sup>16</sup> In other words, households moving to a higher-income region (e.g., Mississippi to New Jersey) on average tend to receive higher income (due to

<sup>16</sup> The adverse effect of income inequality on low-income households has widened over the last decade in many OECD countries. In the United States, the estimated coefficients of income distribution (Gini coefficient) has turned more negative for low income households (from -1.5 to -3.0 from 2004 to 2013 Figure 6), suggesting that poor households would need higher average state income to compensate for greater income inequality, let alone inequality itself is also rising.

higher state income) but disproportionately across income classes because of the varying effects of income inequality. Similar patterns are observed in the estimated coefficients of average regional income and regional income distribution for selected OECD countries ([Appendix C Table C.2](#)).

The incentives to move can be measured by the number of destination regions that generate higher income (positive returns) relative to the households' income in the origin region. The number of destination regions that generate higher income may change over time. We measure in two different vintages—e.g., 2004 and 2013 for the United States, 2007 and 2013 for Spain, and 2004 and 2012 for Mexico—to assess how the number of destination regions that yield positive returns (incentives for household to move) have changed over the years. Our results suggest that mobility returns for interregional migration have declined across the board in the U.S. during the past decade, but more so for households in low-income deciles in low-income regions. The number of destination states that generate higher returns fell by over 30 percent over the last decade for the bottom quartile households, and by about 25 percent and 15 percent for the middle and upper-income classes, respectively ([Figure 5 right chart](#)).<sup>17</sup> Moreover, the deterioration was sharper in regions with lower per-capita GDP. Similar results hold for many other advanced countries such as Spain, while the reduction of incentives is uniform across income classes in some emerging markets such as Mexico. Our results are corroborated by the findings of declining U.S. interstate mobility in Nunn, Parsons, and Shambaugh (2018), and slowing interregional labor mobility in the European Union (Arpaia, Kiss, Palvolgyi, and Turrini 2014; Liu 2018). Further analysis on the factors contributing to declining mobility would help assess the relative roles and interconnections among housing prices, income inequality, and the workforce skills and education levels.

### ***Fiscal Redistribution and Within-Region Income Inequality***

Redistributive fiscal policies have helped reduce, but not fully offset, rising nationwide income inequality (IMF 2017; Immervoll and Richardson 2011). For advanced OECD countries, the average redistributive effect of fiscal policy—measured by the difference in Gini coefficients on household income before and after taxes and transfers—is about one-third (from 0.49 Gini points from market income inequality to 0.31 Gini points for disposable income inequality in 2015) ([Figure 6 top left panel](#)). About three-quarters of the fiscal redistribution was achieved on the transfer side, while progressive taxation contributed the remaining one quarter. Across household income classes, benefits and transfers have helped reduce inequality more so than tax and social contributions.

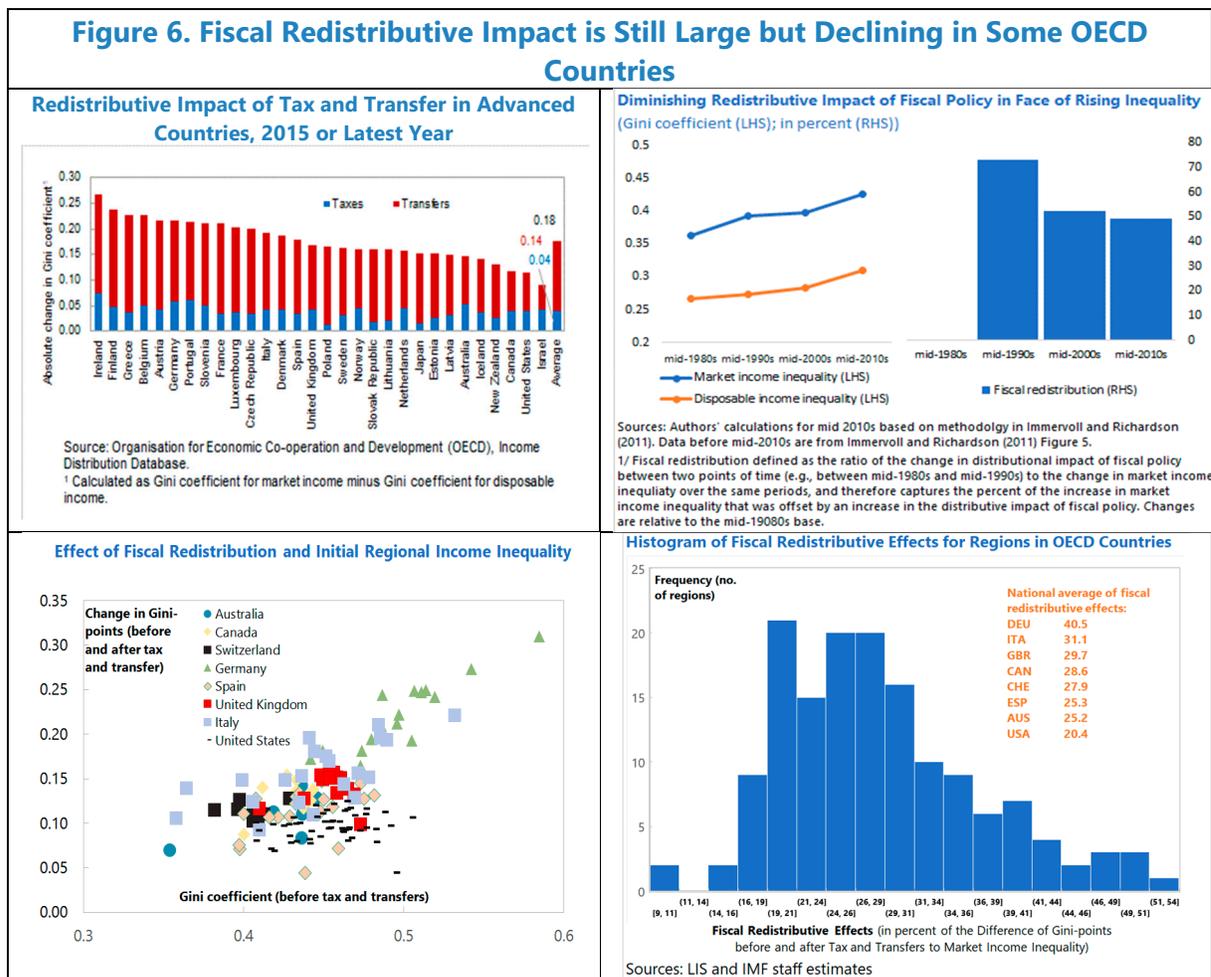
The redistributive impact of fiscal policy, while still large nationwide, has declined since the mid-1990s in some OECD countries. Progressive fiscal policies provide an automatic mechanism to counter the rise of income inequality, even without active policy measures. The redistributive effects of fiscal policies seem to have flattened (in many European countries) or diminished (such as in the United States). The average redistributive effects (the change of Gini coefficients between before and after tax and transfer) have declined from 53 percent to about 50 percent in

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<sup>17</sup> It is calculated based on the change in the share of destination states that would incur a negative return  $[(\sum_{s,t} \mathbf{1} \cdot (R_{s,s'}^{2013}) \geq 0) - (\sum_{s,t} \mathbf{1} \cdot (R_{s,s'}^{2004}) \geq 0)] / (\sum_{s,t} \mathbf{1} \cdot (R_{s,s'}^{2004}) \geq 0)$  between 2004 and 2013. 1 denotes a value of 1 for dummy variable that the destination state incurs a negative return.

the group of selected OECD countries over the last decade (Figure 6 top right panel). This reinforces earlier findings that the fiscal redistributive role has declined over the mid-1990s to mid-2000s (Immervoll and Richardson 2011).

The impact also varies significantly across regions in some countries. At the regional level, the redistributive impact of fiscal policies is similar regardless of initial within-region inequality in many countries (Figure 6 bottom left panel). For example, fiscal redistribution in the United States has reduced income inequality on average by about one-fifth (from 0.46 to 0.37 Gini points in 2016) and the redistributive effects are similar (about 0.1 Gini point) across states independent of their initial market income inequality in 2016. Similar patterns are observed in United Kingdom, Switzerland, and Spain. The exceptions are Germany and Italy where the fiscal redistribution effects are larger in regions with higher within-region market income inequality. For example, in Germany, taxes and transfers have reduced market income inequality by over 40 percent (from 0.5 to 0.28) with stronger redistribution in states where market income inequality is higher (Figure 6 bottom right panel). In some regions in Canada and United States, tax and transfer schemes have only reduced inequality by less than 0.05 Gini points (just about 10 percent of market income inequality), relative to about one-third at the national level.



The different fiscal redistributive effects across regions are sometimes driven by national policies rather than spatially-targeted policies. The impact varies across regions largely because of the concentration of tax bases (e.g., high-income earners) and beneficiaries (e.g., poor and unemployed) in certain regions. For example, for regions where the per-capita unemployment insurance or pension benefits are the same, those with high unemployment or a large elderly population will receive a larger share of total benefits. As most benefits are targeted to low-income households and the progressive tax is usually levied on high-income households, these fiscal policies also affect the regional disparity of income levels.

### III. A POLICY FRAMEWORK FOR TACKLING REGIONAL INEQUALITY

*“Regional inequality is a hard problem to solve... economists need to try harder to find solutions” the Economist, December 2016.*

This section outlines a conceptual framework that aims to identify whether, when, and how to use fiscal policies to tackle regional inequality. The framework consists of four steps, building on IMF operational guidelines on inequality (IMF 2018) (Figure 7). The first step is to determine whether regional inequality matters from a macroeconomic perspective. The next step is to identify the key determinants of regional inequality, followed by the third step of selecting strategies and policies to tackle regional inequality. The final step is to determine which level of government is responsible for designing and implementing the policies. The rest of this section discusses each step in more detail.

#### A. Determine If Regional Inequality Is Macro-critical

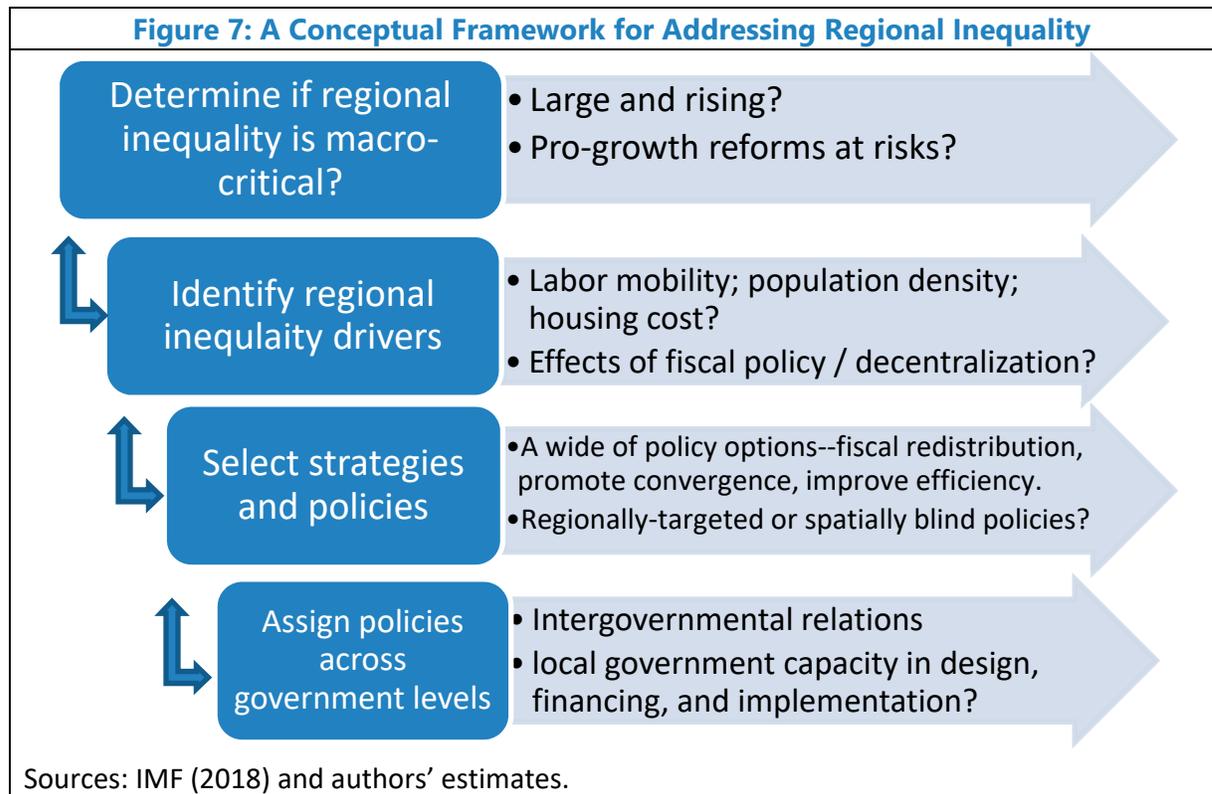
Regional inequality may raise challenges for macroeconomic stability, long-term growth, and structural reforms. In some cases, a certain degree of regional inequality is a natural result of efficient resource allocation. In other cases, it could be driven by negative externalities and rent-seeking activity (Kline and Moretti 2014; Bastagli, Coady, and Gupta 2012), which can give rise to distortions that dampen growth or weaken the support for pro-growth reforms. Even if regional inequality is determined to be macro-critical, tackling it should not compromise long-term growth and macroeconomic stability.

Establishing the facts on regional inequality, such as its size and persistence, can help assess its macro-criticality. A starting point could be to determine how salient regional inequality is across different economic and social indicators (income levels and distribution, unemployment, health, and education), benchmark across relevant comparators, and adjust for differences in regional prices. The findings in Section II would suggest that in some countries such as Spain, Italy, and Poland, the regional disparities on income and unemployment levels are large and persistent, which might have wider macro consequences if left unaddressed. In contrast, in other countries such as Germany, the regional disparity of unemployment rates is relatively low.

#### B. Identify Regional Inequality Drivers

Identifying the drivers of regional inequality is essential if it is deemed relevant for policymakers to address. As highlighted in Section II, large and persistent regional inequality has been partly

driven by declining labor mobility. Empirical results also suggest that fiscal decentralization would tend to reduce regional inequality to a certain extent. The literature also points out that natural resource endowments, proximity to markets, the geographical segregation of socially-disadvantaged groups, and the spatial mismatch between jobs and workers are other key drivers (Lessman and Seidel 2017).



### C. Select Fiscal Strategies and Policies

The choice of strategies and fiscal policies to tackle regional inequality is country and context specific. It should depend on characteristics of the country's lagging and leading regions and the key regional inequality drivers previously identified. Other considerations include the available policy space, the country's political economy and implementation capacity, and society's preference for interregional redistribution. The choice should ensure efficient allocation of resources, macroeconomic stability, and be growth-friendly.

There are a wide range of policy options to tackle regional inequality. Policymakers could scale up the size of fiscal redistribution to mitigate inequality, which could entail additional fiscal costs. Growth-friendly policies in the areas of education, healthcare, infrastructure, and affordable housing are also critical to improve the mobility of less skilled, low-earning individuals towards high earning areas thus helping to facilitate regional convergence.

Policymakers can also adopt strategies to improve policy efficiency with spatial considerations. Strategies to tackle regional inequality are broadly classified as spatially-blind or targeted. The two are not necessarily substitutes, but rather often complement each other. Broadly speaking,

spatially-blind (or people-based) policies target recipients nationwide regardless of their place of residency. They can also aim at reinvigorating economic convergence by reducing barriers to factor mobility, especially for disadvantaged households, which face declining mobility as shown in Section II. Typical examples include U.S. progressive federal income tax systems and the national social security and unemployment benefits in France and Spain.<sup>18</sup> On the other hand, spatially-targeted (or place-based) policies target households and firms in one or more regions. Such policies try to promote regional equity, growth that is spatially broad and inclusive, and to insure against regional idiosyncratic shocks such as natural disasters (Kim and Dougherty 2018). Their coverage is thus subnational and such policies rely mostly on tax incentives, subsidies, grants, and public infrastructure spending. Examples include the European Union’s Regional Development Fund.

The choice of spatially-targeted strategies depends on a few considerations:

- *Interregional mobility, population density, and regional concentration of recipients.* Spatially-targeted strategies are preferable when lagging regions are densely-populated (larger agglomeration benefits) and production factors face strong barriers to move.<sup>19</sup> In addition, in cases where targeted recipients (e.g., unemployed or people in poverty) are concentrated in certain regions, spatially-targeted policies have merits to complement other spatially-blind means-tested policies, as policies promoting labor mobility may turn out to be ineffective or too costly given the sheer size of the targeted group (Section IV).
- *Targeting challenges and capacity.* Spatially-targeted interventions may also be justified when targeting people (e.g., means-testing) nationwide is faulty or difficult. In countries without the administrative capacity or political accountability to manage spatially-blind interventions such as progressive tax systems or cash transfers, a more geographically narrow version of these programs such as place-based people programs could be more effective (Coady, Grosh, and Hoddinott 2004).
- *Horizontal equity.* Spatially-targeted policies may give rise to horizontal equity concerns—different treatment among equals—by excluding individuals and firms residing outside the targeted regions, even though they have similar status to those in the targeted regions. As ensuring uniform access of public goods and services across regions is not feasible (Boadway and Eyraud, 2018), an alternative would be to equalizing fiscal capacity across local governments to ensure certain standards of public goods and services with comparable tax rates may be more appropriate (Blochliger and Charbit 2008; see Section III.D).
- *Effectiveness and externalities.* Spatially-targeted policies are more warranted if fiscal interventions are expected to have stronger impact in lagging regions. For example, spatially-targeted policies of hiring incentives could have a higher impact to create jobs and promote

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<sup>18</sup> Spatially-blind policies also include national policies that ensure uniform access to public health, education, and social safety nets across regions. They also include transfers arrangements to equalize the fiscal capacities of different regions to provide similar services (World Bank 2009; Hopkins, Bastagli, and Hagen-Zanker 2016).

<sup>19</sup> Factor mobility may be hampered by non-economic barriers (e.g. geographical remoteness, discriminatory policies preventing nationwide coverage of tax breaks and welfare benefits to specific social groups (World Bank, 2009), and congestion externalities (e.g. high housing costs, pollution, long commute (OECD, 2009).

growth in regions with high unemployment (Austin, Glaeser, and Summers 2018). Moreover, spatially-targeted policies may have merits if regional disparity of income or unemployment creates adverse externalities for neighboring regions or wider adverse social outcomes (Hendrickson and others 2018; Nunn and others 2018).

**Table 5. Spatially-Targeted Interventions**

Interventions	Policy goals	Instruments	Coverage	Recipients	Examples
1 Enterprise Zone	Attract firms to create jobs in the lagging regions.	Hiring tax credits; corporate and personal income tax credits; tax-exempt financing; property, corporate, and wage tax relief.	Zones, Communities within the region	Mainly firms; Sometimes workers and communities	California enterprise program, U.S. Federal Empowerment Zones, France's enterprise zones, China's Special Economic Zones
2 Cluster Promotion	Increase collaboration among firms and between firms and public-sector research institutions	Tax incentives and public spending in research and development	Region at large, Communities within the region	Firms	France Local Productive System; Germany's (Bavaria) High-Tech Offensive
3 Large-Scale Infrastructure	Promote structural transformation	Public investment in transport, energy, telecommunications	Lagging and leading regions	Untargeted	U.S. interstate highway system, EU Structural Funds; and national transportation networks in Spain and China.
4 Place-People based	Compensate individuals for relocating to or living in a particular region (e.g. affordable housing)	Tax benefits, transfers, grants	Low-income areas, neighborhoods.	Individuals, Real-state developers	U.S. low-income housing tax credit; Spain's tax credits in income tax for unemployed that relocate for jobs in other regions.

Sources: World Bank (2009), Neumark and Simpson (2014), and authors' estimates.

Spatially-targeted interventions take many forms but often with mixed effects. Common examples include enterprise zones, industry clusters, and infrastructure (Table 5 and Appendix D). Fiscal instruments include a mix of tax incentives, subsidies, grants, public investment, and welfare spending. The effectiveness of these interventions, particularly over the long-term and countrywide, has been mixed.<sup>20</sup> This is because (1) gains in the targeted regions such as higher employment are often temporary and offset by losses in other nontargeted regions; (2) the capacity of lagging regions to attract and retain firms and talents is usually overestimated; and (3) rent-seeking and political capture lead to underperforming results.

A new generation of spatially-targeted interventions is trying to address the shortcomings of traditional place-based policies with a focus on the digital economy. Usually referred to as place-sensitive policies, they consider the higher efficiency in leading regions and focus on innovative industries and digital infrastructure (Iammarino, Rodriguez-Pose, and Storper 2018). Recent proposals include facilitating labor mobility to leading regions, boosting labor (digital) skills, and broadening access to broadband (Hendrickson, Muro, and Galston, 2018).

#### D. Assign Policies Across Government Levels

Assigning the levels of government that are responsible for policy design, implementation, and financing should be country and context specific. As a general principle, the central government would usually lead on policy design given their stronger capacity and the ability to fully

<sup>20</sup> See Neumark and Simpson 2014, Jarowski and Kitchens 2016, Hendrickson, Muro, and Galston 2018, and Crescenzi and Rodriguez-Pose 2012.

(continued...)

internalize costs and benefits across regions.<sup>21</sup> On the other hand, subnational governments (SNGs), by knowing better local preferences and needs, could be in a better position to implement such strategies, as long as they also have sufficient technical capacity and political accountability.<sup>22</sup>

For spatially-blind policies, the central government is usually responsible for the design and monitoring, while the implementation is sometimes delegated to SNGs. Central governments are better equipped for spatially-blind policies given their broader jurisdictional coverage. The need to ensure uniformity of access to some public goods and services (e.g. universal primary education) and horizontal equity also calls for a centralized approach. SNGs, in turn, can implement policies at preset standards. For instance, the design and monitoring of a social safety net is usually established at the central level while some decentralization of administration and implementation can be appropriate to improve accountability and leverage on information advantage of SNGs (Escolano and others 2015; Martinez-Vazquez and others 2008). On the tax side, there is a case for assigning both the design and implementation of income tax systems to the central government given incentives for local tax competition and their impact on location.

Subnational governments could be more involved in the design and implementation of spatially-targeted policies. SNGs' jurisdiction and better knowledge over the policy-targeted region would warrant a more decentralized assignment, even when those policies have national objectives and generate an impact outside the targeted regions. Other considerations in assigning government levels to address regional inequality would include:

- *Current level of fiscal and political decentralization.* The scope for SNG involvement depends on the country's degree of fiscal and political decentralization. Higher degree of revenue and spending decentralization will imply SNGs have greater control and capacity to design and implement policies.<sup>23</sup> Greater political decentralization would confer more political autonomy at subnational levels (e.g., local elections and institutional checks and balances) making SNGs more attuned with local preference.
- *The design of intergovernmental transfers.* The empirical literature reviewed in s in Section II shows that fiscal decentralization may reduce regional inequality if it fosters SNG revenue mobilization efforts and better targeted spending without exacerbating fiscal gaps in some cases. The design of intergovernmental transfers will be critical to this effect. Formula-based equalization transfers—that allow SNGs to provide minimum levels of public services, while

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<sup>21</sup> This is consistent with Musgrave's classic three-function framework that national objectives such as macroeconomic stabilization and sustained growth are better left to central governments (Musgrave, 1959).

<sup>22</sup> Superior knowledge of local preference is the key motive for the first-generation normative approach on fiscal decentralization (Oates, 1972), while the lack of technical capacity and political accountability are the main caveats in subsequent second generation positive approach to fiscal federalism (IMF 2009; Valdesalici and Palermo 2018).

<sup>23</sup> Among OECD countries, SNGs are on average responsible for about 40 percent of total public expenditure, 60 percent of public investment and where the share of taxes allocated to subnational governments, while still small, has grown over the last two decades (OECD 2016; Blochliger and Nettlely, 2015). During 1995 to 2011, the share of taxes allocated to SNGs increased from 13.5 to 15.5 percent, mainly at the state level, reflecting increased powers over tax bases and rates.

granting them full discretion on their own tax-expenditure mix—are shown to achieve these objectives (Boadway and Eyraud 2018).

- *SNG technical capacity.* The capacity of SNGs to carry out effective fiscal policies is a key consideration. In the design stage, SNGs need capacity to assess the impact to decide the type, coverage, and beneficiaries of the policy, while in the implementation stage, SNGs need to have sound revenue administration and public financial management systems to monitor compliance and evaluate policy performance (IMF 2009).

Coordination is key among government levels given shared responsibilities. Considering the conditions above, strategies to tackle regional inequality are often shared across different government levels. Hence, strong coordination between government levels is necessary.

#### IV. SPATIALLY-TARGETED FISCAL REDISTRIBUTION: AN ILLUSTRATIVE EXERCISE

This section illustrates that spatial considerations can help improve the cost-effectiveness of fiscal redistribution programs. Countries often use a variety of measures such as means-tested income support programs, and universal child benefits and social pensions to mitigate inequality. While means-testing is an important criterion to ensure that policies are targeted to intended recipients, it requires administrative capacity to verify information, process applications, and deliver transfers, which if not met, could lead to under-coverage of the poor and leakage of benefits to the rich.

We illustrate whether and under what conditions spatially-targeted policies can mitigate inequality and compare this to typical means-testing methods under the same fiscal envelopes. The illustration uses the latest years of LIS household surveys for five OECD countries: France, Mexico, Poland, the United Kingdom, and the United States. Two cash transfer schemes are considered: universal or means-tested. We look at the cost-effectiveness of each of these two schemes when spatial perspectives are considered. The exercise is meant to be illustrative and does not account for changes in household behavior—including mobility—in response to the measures (details in [Appendix D](#)).

##### *Scenario 1: Universal transfers*

➤ *Spatially-blind.* Our benchmark consists of a lump-sum cash transfer to all households nationwide, akin to the universal basic income (UBI). Transfers are calibrated at 25 percent of median per capita income nationwide similar to IMF (2017). They are additional to existing programs without considering the financing of the transfers cost. The estimated distributional impact of this program is substantial (a reduction in income inequality of about -0.03 to -0.04 Gini points). The impact is particularly stronger in countries where disposable income is more unequally distributed. Fiscal costs under the program would range between 3.7-6.8 percent of GDP.

➤ *Spatially-targeted.* The above-defined lump-sum cash transfers are now targeted only to lagging regions. In the case of the United States, such a transfer targeted to regions in the lowest 45<sup>th</sup> percentile regional disposable income would reduce inequality to 0.39 Gini points at a fiscal cost of 0.6 percent of GDP. This would amount to 15 percent of the redistributive effects of the nationwide (spatially-blind) lump-sum cash transfers at just about 10 percent of the fiscal cost

(Table 6). The greater cost-effectiveness of this spatially-targeted transfer is due to the relative concentration of poor households in poor regions. This concavity is observed across selected countries, underscoring that spatially-targeting has slightly better cost effectiveness in mitigating inequality.

### Scenario 2: Means-testing transfers

➤ *Spatially-blind.* The benchmark in this scenario is a spatially-blind means-tested program, defined as a lump-sum cash transfer to low-income households in the lowest two deciles of the nationwide income distribution regardless of where they live. This means-tested program has some leakages, which are calibrated identical to IMF (2017) to the ratio of current noncontributory transfer relative to those eligible. The total transfer to those low-income households (fiscal cost) is normalized to be 1 percent of GDP for comparison purposes (Table 5).

➤ *Spatially-targeted.* The above mean-tested program is now targeted only to lagging regions—those regions with income level below the 45-percentile average regional income—with the transfers to the lowest two deciles of the income distribution. The *total* transfer amount to low-income households in those regions (fiscal cost) is set to be 1 percent of GDP. The results show that the spatially-targeted means-tested program would be more cost-effective (i.e. greater decline of Gini coefficients conditional on the same fiscal cost) than typical means-testing if leakages in the spatially-blind program are large and low-income households are more concentrated in lagging regions (Table 7 and Figure 9 top left and right panels). For example, countries with low leakage such as the United Kingdom and France will find standard (spatially-blind) means-testing better than a means-tested program targeting lagging regions.

<b>Table 6. Gross Fiscal Cost and Redistributive Impact of Regional-Targeted Transfers</b>			
<i>A transfer of 25 percent of net median market income per capita to selected households</i>			
<b>Country (Year of data)</b>	<b>Gross fiscal cost (in percent of GDP) 1/</b>	<b>Gini coefficient</b>	<b>Reduction in Gini coefficient</b>
<b>France (2010)</b>		0.320	
Universal transfers	6.8	0.284	-0.036
Spatially-targeted transfers <sup>2/</sup>	0.8	0.319	-0.001
<b>United Kingdom (2013)</b>		0.360	
Universal transfers	6.7	0.320	-0.040
Spatially-targeted transfers <sup>2/</sup>	0.2	0.359	-0.002
<b>United States (2013)</b>		0.396	
Universal transfers	6.4	0.349	-0.048
Spatially-targeted transfers <sup>2/</sup>	0.6	0.390	-0.007
<b>Poland (2013)</b>		0.356	
Universal transfers	4.9	0.320	-0.036
Spatially-targeted transfers <sup>2/</sup>	0.5	0.349	-0.007
<b>Mexico (2012)</b>		0.480	
Universal transfers	3.7	0.438	-0.042
Spatially-targeted transfers <sup>2/</sup>	1.2	0.470	-0.010

Sources: LIS database and Fiscal Monitor (2017)  
1/ Gross fiscal cost for country-level universal basic income is obtained from October 2017 Fiscal Monitor.  
2/ Spatially-targeted to regions with average income less than 45-percentile of all regional incomes in the national distribution.

In addition to coverage and concentration of the poor, how spatially-targeted redistribution is financed matters. The illustrative exercise above shows a new transfer program that incurs fiscal costs. Alternatively, the new transfer program may substitute for an existing program. In that case, whether spatially-targeting would generate net benefits would depend on the effectiveness and progressivity of the existing program. For example, replacing the current transfer programs—particularly if those are well-targeted and sufficiently progressive such as in France or the United Kingdom—could weaken the overall fiscal redistribution. If the current program is progressive (i.e., higher redistributive power for each unit of fiscal cost) then replacing such a program with a spatially-targeted variant may not be optimal from the redistributive perspective.

**Table 7. Illustrative Redistributive Effects of Regional-Targeted Transfers Relative to Means-Testing at Different Coverage Levels**

Countries	Current		Redistributive impact (scaled to 1 percent of GDP fiscal cost)				Regional-targeted transfers 2/
	Coverage level 1/	Current coverage	Hypothetical coverage levels				
			60	70	80	90	
France	66	0.0074	0.0073	0.0085	0.0097	0.0109	0.0016
Mexico	63	0.0074	0.0071	0.0082	0.0094	0.0105	<b>0.0100</b>
Poland	46	0.0079	0.0103	0.0119	0.0136	0.0152	<b>0.0137</b>
United Kingdom	83	0.0086	0.0065	0.0076	0.0086	0.0097	0.0083
United States	61	0.0093	0.0093	0.0101	0.0115	0.0129	<b>0.0124</b>
<i>Average</i>	63.8	0.0081	0.0081	0.0093	0.0106	0.0118	<b>0.0092</b>
Advanced economies	70	0.0084	0.0077	0.0087	0.0099	0.0111	0.0074
Emerging markets	54.5	0.0077	0.0087	0.0101	0.0115	0.0129	<b>0.0119</b>

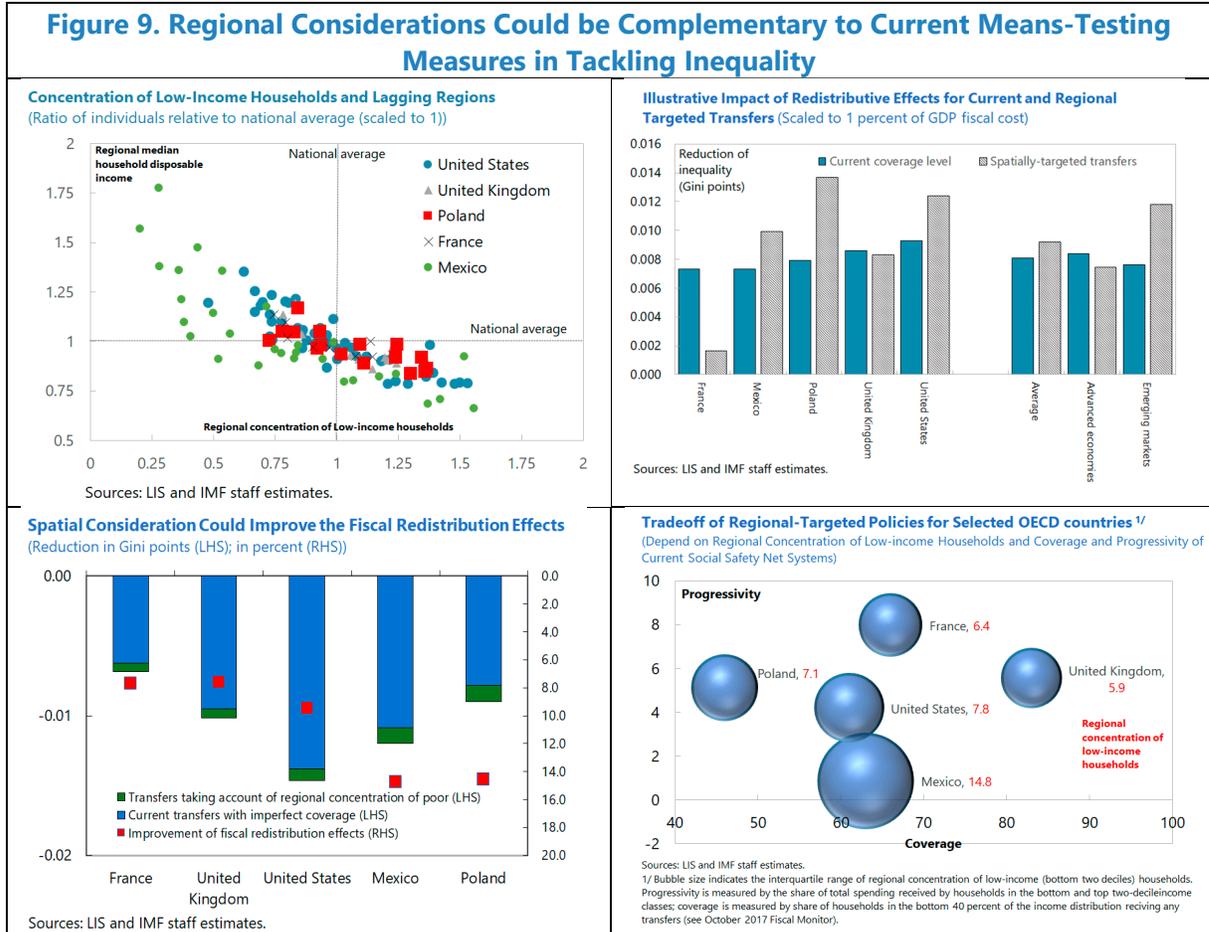
1/ Current coverage level is obtained from October 2017 Fiscal Monitor based on LIS database.  
2/ Cells in bold indicate stronger redistributive power for regional targeted transfers relative to current coverage levels under the same fiscal cost.

*Scenario 3. Means-tested transfer with budget allocation proportional to regional concentration of poor.*

➤ *Spatially-blind.* The benchmark in this scenario is a spatially-blind means-tested program (same as scenario 2) to low-income households in the lowest two deciles of the nationwide income distribution, subject to imperfect coverage observed in the data.

➤ *Spatially-targeted.* It considers the same total transfers (budget neutral) but distributed to the households in the lowest income quintile according to the regional concentration of the poor, that is, if a region has 10 percent of population in the lowest income quintile, it receives 10 percent of total transfers, split among the poor households in the area. Given that conventional means-testing has imperfect coverage for the households in the lowest income quintile, transfers that accounts for geography of where low-income households live would improve the overall fiscal redistribution effects. The improvement varies by countries, ranging from 7-15 percent, depending on the progressivity and coverage of current spatially-blind means-tested programs and the concentration of poor in those countries (Figure 9 bottom left panel). For example, the United

Kingdom has good coverage and progressive programs so that the improvement from spatial considerations are expectedly small. But for countries like Mexico and Poland where the coverage is relatively low and the poor households are highly concentrated, improvements are likely larger (Figure 9 bottom right panel).



Based on the illustrative results, policies that consider spatial dimensions can complement the existing means-testing in tackling regional inequality, particularly when (1) low-income households are concentrated in lagging regions with low state income or high unemployment rates and household mobility is limited; 2) horizontal equity concerns are less prevalent; 3) targeting to poor households through means-testing is difficult subject to leakages; 4) existing programs are not very progressive or effective in fiscal redistribution.

The process for determining the level(s) of government for spatially-targeted measures should be similar to those in Section III.D. This would include the choice of government levels in the design, implementation, monitoring, and/or financing for the government measures. Finally, our analysis focuses on state or provincial levels but could be generalized to tailor lower-regional levels such as cities or counties or urban versus rural.

**Caveats.** Horizontal-equity concerns may arise in which households facing the same outcomes (e.g., poverty) may not receive the same benefits because of their residency. This could raise political economy issues and make the design and the adoption of spatially-targeted policies more challenging. Second, as in other means-tested transfers, spatial-targeting could bring incentive problems that encourage abuse by misreporting residency and generate distortions in locational choice. Third, programs to account for regional dimensions also depend on the government capacity, which is not considered here.

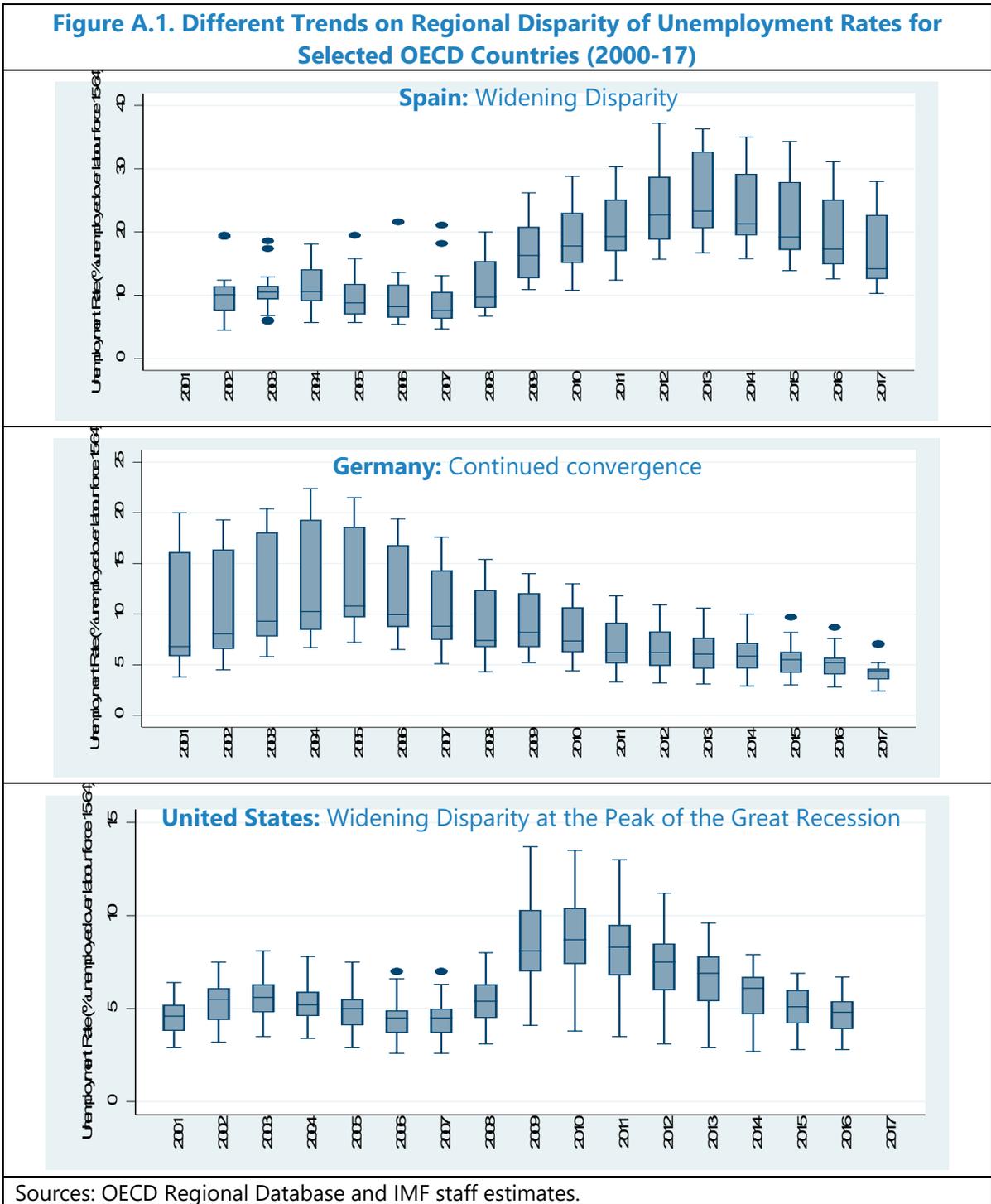
## V. CONCLUSIONS

This paper illustrates that regional dimensions are important in the discussion of the nature of inequality and policy options to address it. It presents several new stylized facts. Regional inequality in many OECD countries has been large (even adjusting for regional price differences), persistent, and widening over time. This implies regional divergence in some OECD countries. Rising regional disparity in income is in part associated with declining regional labor mobility in a country, particularly for low-income households in lagging regions. These trends could lead to wider economic underperformance if left unaddressed as lagging regions fall behind their potential and possibly drag nationwide growth.

The paper provides a conceptual policy framework to address regional inequality. Identifying key determinants and determining a strategy—place-based or spatially-blind—and assigning the appropriate levels of government will be critical. In an environment where typical fiscal redistributive policies have turned less effective in tackling regional inequality, our illustrative exercise suggests that measures that account for regional dimensions could complement national means-tested transfers. Spatially-targeted fiscal redistribution would be more effective when low-income households are concentrated in lagging regions and face barriers to move, and existing means-testing faces leakages and low coverage.

VI. APPENDIX

A. Evolution of Regional Disparity on Unemployment Rates



## B. Empirical Estimation on Key Determinants of Regional Inequality

Potential key determinants of regional inequality are estimated based on an unbalanced panel of 18 OECD countries over the period 1984-2016. Panel regression allows for better precision in estimation, although choosing the right panel model is a challenge. This section uses a clear specification strategy to select the suitable model (Baltagi 2005). Using the Least Square Dummy Variable (LSDV), the Wald test shows that the country specific dummies are not jointly equal to zero. The Lagrange multiplier test suggests that the individual specific errors are uncorrelated to the regressors. The Sargan-Hansen statistic concludes the Fixed Effects model (FE), relative to Random Effects (RE) models, is the most appropriate even when controlling for potential heteroskedasticity as suggested by the Wald statistics. In that context, the estimation uses the FE model while controlling for heteroskedasticity and temporal dependencies using the Huber-White Sandwich estimator following the statistical test for the presence of serial correlation in an unbalanced panel.

The estimation also accounts for the presence of endogeneity arising from reverse causality, simultaneity, or omitted variable bias. For instance, countries with higher regional inequality may have larger intergovernmental transfers (Lessmann and Siedel 2017) or persistent regional inequality may lead to greater preference towards deeper fiscal decentralization (Bartolini and others 2016). For simultaneity, potential migrants may choose destination regions based on how income inequality is, partly because new migrants are more likely at lower income class, while governments develop fiscal redistribution policy considering the impact on their immigration policy. While the fixed effect estimator partially accounts for the reverse causality concern, we also use the two-stage least-squares within estimator (FE2SLS) to address any estimation bias from endogeneity (Drinkwater 2003).<sup>24</sup> We use lagged explanatory variables and other exogenous variables (the unemployment rate, the share of housing costs in household income, ratio, and the share of nonworking age population the dependency ratio etc.) selected on relevance and validity tests as instrumental variables.

**Table B.1. Choice of Estimation Methods**

<b>Dependent variable: Regional disparity of per-capita GDP (90th-10th percentile)</b>				
		Two-Stage Least-Square		
		Fixed Effects (FE)	Fixed Effects (FE2SLS)	
log (Per Capita GDP)	✓	24.03*** (7.941)	✓	13.90* (7.821)
(log(Per Capita GDP)) <sup>2</sup>	✓	-1.150*** (0.389)	✓	-0.646* (0.390)
GDP Growth	✓	-0.00542 (0.00312)	✓	-0.00688* (0.00412)
Population density	✓	-0.00761 (0.00451)	✓	-0.0111** (0.00445)
Gross value-added resource sector	✓	0.0121* (0.00646)	✓	0.0113 (0.0126)
Unemployment disparity <sup>1</sup>	✓	0.0174* (0.00821)	✓	0.0402*** (0.0141)
Net migration rate	✓	-0.196 (0.204)	✓	-0.324* (0.171)
Physicians per 1000 population	✓	-0.0258* (0.0144)	✓	-0.0665*** (0.0248)
SNG revenue share	✓	0.00642 (0.00416)	✓	0.0189** (0.00736)
Observations	✓	167	✓	160
R-squared	✓	0.615	✓	0.520
Number of countries	✓	16	✓	14

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

<sup>24</sup> The estimated coefficients for the fixed-effect model is not just the result of a cross-country comparison, but mainly of within a country comparison over time. Hence, regardless of the initial level of regional disparity, the estimated coefficients reflect also the changes of the variables over time.

**Estimation Results.** The baseline result uses the FE2SLS estimator to control for endogeneity, comparing with the results using a fixed effect estimator (FE) with clustered standard errors (Table B.1). Main empirical results are discussed in the main text, with regression results showing the key determinants of regional disparity on per-capita GDP in Table 3 in the main text. The effects of fiscal decentralization on regional inequality in unitary and federal countries is listed in Tables B.2 and B.3.

**Table B.2. Effects of Fiscal Decentralization on Regional Inequality**

<b>Dependent variable: Regional disparity of per-capita GDP (90th-10th percentile)</b>						
Explanatory variables	Specifications					
	1	2	3	4	5	6
log (Per Capita GDP)	15.86** (7.412)	20.11*** (6.256)	16.01** (7.433)	25.71*** (7.494)	25.74*** (7.635)	24.44*** (6.419)
(log(Per Capita GDP)) <sup>2</sup>	-0.744** (0.369)	-0.957*** (0.308)	-0.750** (0.367)	-1.231*** (0.366)	-1.233*** (0.373)	-1.167*** (0.315)
GDP Growth	-0.00687* (0.00397)	-0.00743** (0.00339)	-0.00286 (0.00237)	-0.00598** (0.00281)	-0.00590** (0.00278)	-0.00487* (0.00253)
Population density	-0.0105** (0.00426)	-0.00846** (0.00417)	-0.0108*** (0.00376)	-0.00721* (0.00407)	-0.00717* (0.00406)	-0.00820** (0.00417)
Gross value-added of resource sector	0.00958 (0.0112)	0.00487 (0.00737)	0.0420*** (0.0142)	0.0131* (0.00731)	0.0130* (0.00717)	0.00966 (0.00599)
Unemployment disparity <sup>1</sup>	0.0333** (0.0131)	0.0258*** (0.00823)	0.0283*** (0.00906)	0.0146** (0.00720)	0.0147** (0.00721)	0.0147** (0.00641)
Net migration rate	-0.382** (0.193)	-0.415** (0.200)	-0.119 (0.134)	-0.384* (0.229)	-0.387* (0.233)	-0.390* (0.223)
Physicians per 1000 population	-0.0491** (0.0201)	-0.0267* (0.0150)	-0.0231 (0.0263)	-0.00911 (0.0174)	-0.00965 (0.0173)	-0.0110 (0.0170)
SNG revenue share	0.0170** (0.00695)					
SNG Expenditure share		0.0139*** (0.00428)				
SNG Debt share			0.0335*** (0.00986)			
Transfer dependency (Expenditure)				-0.00476 (0.00901)		
Transfer dependency (Revenue)					-0.00244 (0.00658)	
Vertical fiscal imbalance						0.591* (0.342)
Underidentification test: Kleibergen-Paap rk LM statistics (p-value)	0.0571	0.0685	0.0794	0.0976	0.0802	0.0847
Overidentification test: Hansen-J statistics (p-value)	0.2786	0.3060	0.2746	0.2752	0.3819	0.1988
Observations	160	160	191	160	160	160
R-squared	0.557	0.598	0.629	0.600	0.599	0.615
Number of countries	14	14	18	14	14	14

Note: FE2SLS estimation; instruments include lagged values of fiscal decentralisation, net migration, and other exogenous variables like the unemployment rate, the share of housing cost in household income, ratio, the share of non-working age population, the dependency ratio. Instruments are selected based on their relevance and validity using Kleibergen-Paap rank underidentification and Hansen J overidentification tests. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table B.3. Robustness: Including Year Fixed Effects

Dependent variable: Regional disparity of per-capita GDP (90th-10th percentile)						
Explanatory variables	Specifications					
	1	2	3	4	5	6
log (Per Capita GDP)	18.13*	22.55***	3.827	24.47***	24.77***	21.49***
	(10.73)	(6.465)	(9.993)	(7.157)	(6.157)	(6.694)
(log(Per Capita GDP)) <sup>2</sup>	-0.861	-1.087***	-0.132	-1.174***	-1.190***	-1.034***
	(0.528)	(0.319)	(0.497)	(0.351)	(0.303)	(0.332)
GDP Growth	-0.00542	-0.00589	-0.00693	-0.00666	-0.00711	-0.00276
	(0.00492)	(0.00524)	(0.00624)	(0.00484)	(0.00495)	(0.00454)
Population density	-0.0123***	-0.0120***	-0.0126***	-0.00985**	-0.00976**	-0.0143***
	(0.00457)	(0.00352)	(0.00442)	(0.00477)	(0.00463)	(0.00426)
Gross value-added of resource sector	-0.00796	-0.0136	0.0398***	-0.00865	-0.00768	-0.0152*
	(0.0107)	(0.00936)	(0.0131)	(0.00678)	(0.00657)	(0.00797)
Unemployment disparity <sup>1</sup>	0.0375**	0.0307***	0.0527***	0.0251**	0.0237**	0.0398***
	(0.0160)	(0.00826)	(0.0110)	(0.0113)	(0.0118)	(0.00624)
Net migration rate	-0.304*	-0.332*	-0.0710	-0.351*	-0.291	-0.343**
	(0.159)	(0.175)	(0.156)	(0.188)	(0.193)	(0.169)
Physicians per 1000 population	-0.0430	-0.0226	-0.0625**	-0.00715	-0.00571	-0.0280
	(0.0343)	(0.0208)	(0.0302)	(0.0286)	(0.0270)	(0.0238)
Unitary X Revenue share	0.00929**					
	(0.00452)					
Federal X Revenue share	-0.0143					
	(0.00893)					
Unitary X Expenditure share		0.0115***				
		(0.00393)				
Federal X Expenditure share		-0.00172				
		(0.00748)				
Unitary X Debt share			0.0463***			
			(0.00933)			
Federal X Debt share			0.0339***			
			(0.0120)			
Unitary X Transfer Dependency (spending)				-0.0217		
				(0.0208)		
Federal X Transfer Dependency (spending)				0.00572**		
				(0.00267)		
Unitary X Transfer Dependency (revenue)					-0.0189	
					(0.0201)	
Federal X Transfer Dependency (revenue)					0.00350*	
					(0.00209)	
Unitary X Vertical fiscal imbalance						0.678**
						(0.312)
Federal X Vertical fiscal imbalance						0.0495
						(0.268)
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	160	160	191	160	159	160
R-squared	0.6781	0.6912	0.6178	0.6829	0.6824	0.6732
Number of countries	14	14	18	14	14	14

Note: FE2SLS estimation; similar instruments as before. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

### C. Interstate Migration and Regional Inequality

Returns of interregional migration are estimated in two steps. First, the effects of location on household income is estimated using a variant of Milanovic (2015) for households over the past decade during 2004-13 using the LIS household income surveys. Second, we use the estimated coefficients to calculate the returns of interregional migration across households in different income classes.

The Milanovic (2015) specification shows that about 90 percent of individual household income can be explained by the average income level and its income distribution of the country in which the individual resides in. His estimation follows a specification:  $y_i = c + \beta \bar{y}_j + \gamma Gini_j + \varepsilon_i$ , where  $y_i$  is the individual's ( $i$ ) household income,  $\bar{y}_j$  is the country's ( $j$ ) average income level (per-capita GDP), and  $Gini_j$  is the Gini coefficient measuring income distribution for the country.

Extending the approach, we estimate separately for 13 countries with data available in the LIS database the following:

$$y_{i,s} = c + \beta \bar{y}_s + \gamma Gini_s + \varepsilon_{i,s} \quad \text{for each income ventile (5th pecentile)} \quad (1)$$

where  $y_i$  denote individual household disposable income;  $s$  is the state / region the household resides in;  $\bar{y}_s$  is the state average income;  $Gini_s$  is the state average inequality of income distribution, measured by state Gini-coefficient;  $\varepsilon$  is the residual term. The estimation is carried out individually for each income ventile (5<sup>th</sup> percentile, ranked from the poorest to the richest). The above can be rewritten with dummy variable ( $\tilde{D}_v$ ) representing each income ventile ( $v$ ):

$$y_{i,s} = c_v + \beta_v D_v \bar{y}_s + \gamma_v D_v \cdot Gini_s + \varepsilon_{i,s} \quad (2)$$

Empirical results show that the state average income level and its distribution explain about 80-90 percent of the variability of individual household income in most ventiles.<sup>25</sup> In addition, the estimated coefficients vary across income ventiles. While households benefit uniformly from higher state average income (estimated  $\beta$  at about 1), their income is affected differently by the state income distribution, i.e., estimated ( $\gamma$ ) rises with income classes, ranging from -3.5 to 1.2 (Table C.1).

The results imply that when low-income households would prefer a region with less income inequality when choosing between two regions of similar regional average income to relocate. A one Gini point increase in the regional inequality would reduce 3 percent of household income on average. To offset the negative effect, the household in the bottom ventile would need to live in a region with higher average state income by 3.2 percent. On the other hand, a rise of income inequality would benefit the richest by 1 percent for the same average state income level. The estimated  $\gamma$  is close to 0 for the upper-middle income class (75<sup>th</sup>-90<sup>th</sup> percentile), implying that the average state income level ( $\beta$ ) is a key determinant to their income and state inequality does not matter much.

<sup>25</sup> Alternative explanatory variable uses the real per-capita GDP at the regional level to avoid a potential reflexivity problem where the coefficient on beta could be biased toward one because the arithmetic average of percentile values is equal to the mean.

The second step will use the estimated coefficients to calculate the returns of interstate mobility, accounting for differences of regional prices and housing costs. The return of interstate migration ( $R^{s,s'}$ ) for moving from the incumbent region ( $s$ ) to a new region ( $s'$ ) in the country can be expressed as:

$$(R_{s,s'}) = (1 - h_v)\hat{\gamma}_s \cdot P_s - (1 - h_v)\hat{\gamma}_{s'} \cdot P_{s'} \geq 0 \quad (3)$$

$$(1 - h_v) \left( c_v + \hat{\beta}_v D_v \cdot \bar{y}_s + \hat{\gamma}_v D_v \cdot Gini_s \right) \cdot P_s - (1 - h_v) \left( c_v + \hat{\beta}_v D_v \cdot \bar{y}_{s'} + \hat{\gamma}_v D_v \cdot Gini_{s'} \right) P_{s'} \geq 0$$

where  $h_v$  is the share of implicit housing costs to household disposable income based on the LIS database for the  $v^{th}$  ventile income class;  $P_s$  denotes the price level in region  $s$ , obtained from the U.S. Census Bureau of Analysis or approximated by nontradable goods consumption share (about one-third of housing costs based on Gennaioli and others 2014) for other countries that do not report regional prices. The returns across income class for the United States for 2004 and 2013 across 50 states using the LIS household income surveys ( $R_{s,s'}^{2004}$ ); ( $R_{s,s'}^{2013}$ ) are calculated.<sup>26</sup>

**Table C.1. Regression Results of Individual Household Income on Regional Income Level and Distribution** (based on 2013 Household Income Survey for the United States)

	Coefficients on			Robustness check with different measure of income- Coefficients on regional income distribution based on:				
	Average regional disposable income	Regional income distribution (Gini)	Adjusted R-square	(1) Regional disposable income (Gini)	(2) Market income (Gini)	(3) Market income (GE1)	(4) Market income + transfers	(5) Disposable income adjusted for regional prices and housing cost
Overall	0.972	-1.728	0.816	-1.728	-3.303	-1.422	-1.753	-1.675
by income ventile								
0 - 5	0.717	-3.600	0.359	-3.600	-20.077	-8.543	-7.217	-7.329
5 - 10	0.863	-3.302	0.536	-3.302	-13.735	-5.899	-3.173	-4.692
10 - 15	0.926	-3.032	0.711	-3.032	-7.310	-3.075	-3.360	-4.356
15 - 20	1.011	-2.977	0.804	-2.977	-4.835	-1.988	-3.422	-3.726
20 - 25	0.988	-2.017	0.820	-2.017	-3.887	-1.600	-3.026	-3.112
25 - 30	0.994	-1.691	0.853	-1.691	-3.379	-1.430	-2.737	-2.728
30 - 35	0.991	-1.483	0.888	-1.483	-2.924	-1.278	-2.424	-2.433
35 - 40	0.995	-1.347	0.908	-1.347	-2.668	-1.127	-2.342	-2.144
40 - 45	0.985	-1.308	0.926	-1.308	-2.380	-1.022	-2.190	-1.869
45 - 50	1.009	-1.227	0.930	-1.227	-2.195	-0.964	-2.062	-1.566
50 - 55	1.023	-1.085	0.935	-1.085	-1.984	-0.881	-1.899	-1.393
55 - 60	1.029	-0.986	0.930	-0.986	-1.827	-0.822	-1.655	-1.190
60 - 65	1.022	-0.835	0.927	-0.835	-1.583	-0.734	-1.416	-0.915
65 - 70	1.016	-0.643	0.916	-0.643	-1.216	-0.590	-1.134	-0.655
70 - 75	1.026	-0.473	0.909	-0.473	-0.800	-0.411	-0.805	-0.369
75 - 80	1.023	-0.295	0.899	-0.295	-0.637	-0.345	-0.522	-0.089
80 - 85	1.051	-0.028	0.879	-0.028	-0.276	-0.176	-0.091	0.211
85 - 90	1.014	0.281	0.838	0.281	0.133	-0.017	0.410	0.511
90 - 95	0.977	0.632	0.720	0.632	0.739	0.218	1.032	1.292
95 - 100	1.043	1.910	0.142	1.910	3.133	1.398	2.835	2.971

Sources: LIS, Milanovic (2015), and authors' estimates.  
Note: Here only shows the coefficients on regional income distribution ( $\gamma$ ) without other coefficients on regional income level ( $\beta$ ). Market and disposable income refer to before and after tax and transfer, respectively. Adjustment on regional prices and housing cost is discussed in the main text (Fact 1).  
Total observations for the 2013 U.S. household income survey in LIS are 51,498 households.

<sup>26</sup> It involves applying the estimated coefficients to calculate the expected return matrix for each origin-destination state pair (a 50 by 50 matrix for the United States) for the years 2004 and 2013 separately. The results illustrate how many destination states would generate negative returns for each origin state of migration. It also allows the calculation of average expected return of interstate migration, conditional on the migration to destination state yields positive returns.

**Table C.2. Adverse Effects of Income Inequality on Individual Household Income across Income Classes**

Country	Year	No. of obs. (households)	Low-income households	Middle-income households	High-income households
Australia	2010	18,071	-2.8	-1.4	0.8
Canada	2013	23,014	-3.9	-0.4	1.4
Finland	2013	11,030	-2.3	-1.0	1.2
France	2010	15,797	-4.6	-0.8	1.4
Germany	2013	15,946	-2.3	-1.4	0.7
Greece	2013	8,620	-2.4	-1.2	1.1
Italy	2014	8,156	-1.9	-0.6	0.3
Mexico	2012	9,002	-2.9	-1.9	0.6
Poland	2013	37,181	-2.5	-1.1	0.7
Spain	2013	11,965	-3.6	-1.3	1.0
Switzerland	2013	6,792	-2.8	-1.4	0.8
United Kingdom	2013	20,137	-2.8	-1.2	0.7
United States	2013	51,498	-2.4	-0.9	0.5
<b>Average</b>			<b>-2.9</b>	<b>-1.1</b>	<b>0.9</b>

Sources: LIS and IMF staff estimates.  
 1/ Low-income households refer to those below 40th percentile of the household income in the country. Middle-income refers to household income between 40th-75th percentile, and high-income households are those with income higher than 75th percentile.

Besides the differences in the average income level and income distribution between incumbent and destination regions reflected in the first step (equations 1 and 2), two additional components (regional price levels ( $P_s, P_d$ ) and share of housing costs in disposable income ( $h_v$ )) will also affect the return of interstate migration.

**Caveats.** Our calculation of returns is based on estimated coefficients on state average income level and income distribution. The household choice of locations may depend on individual skills and other nonpecuniary returns.

#### D. Spatially-Targeted (Place-based) Policies: Evidence and Lessons

Spatially-targeted policies could promote growth and employment in lagging regions:

1. Spatially-targeted policies such as affordable housing in certain regions could facilitate labor mobility. Individuals in lagging regions may have low skills and face unemployment because of shrinking jobs following the exit of local industries (e.g., coal mining). They are less capable to move out because of job mismatch and lack of skills suitable in leading regions, further hindered by limited supply of affordable housing in leading regions (Neumark and Simpson, 2014).
2. Pro-employment policies (e.g., hiring incentives) targeted in regions may have large impact in regions with higher share of nonworking age population. This could address the negative spillovers posed by widespread unemployment (or nonworking age population) in lagging regions, as shown in the midland regions in the United States by Austin, Glaeser, and Summers (2018). The hardship could be magnified across individuals because of labor skills becoming obsolete and nonemployment reduces local demand, which lead to further decline of labor demand (Topa and Zenou, 2014).

3. Spatially-targeted policies have potentials to address externalities and noneconomic barriers. Nationwide growth may depend increasingly on tapping the growth potentials in lagging regions because the agglomeration in leading regions may lead to congestion externalities, such as long commute and pollution, which could limit the benefits. On the other hand, individuals may face noneconomic barriers from their ethnolinguistic groups and religion, and reside in remote or adverse areas (e.g. mountains and deserts) that spatially-blind policies may be difficult to cover.

However, the effectiveness of spatially-targeted policies is mixed and less conclusive. In the examples of place-based enterprise zones in the United States and France, the net gains in employment are not tied to the hiring incentives offered in the zones and much of the gains accrue to high-income households who own real estate nearby. Tax breaks in the zones mainly relocate activity from outside to inside the zones without much net gains (Neumark and Simpson, 2014). Spatially-targeted interventions are more likely to succeed if they exploit geographical advantages such as the proximity to external markets (World Bank, 2009).

Regarding industrial clusters, evidence from the United States suggests that targeted regions benefit from positive productivity spillovers, but such gains are localized and industry-specific. Gains are higher if industrial clusters focus on technology and have proximity and links to university research. The effectiveness of large-scale regionally-targeted infrastructure programs has been mixed. Evidence from the U.S. interstate highways and European structural funds shows that large-scale infrastructure projects can improve short-term growth and productivity but less certain if it has long-lasting impact (World Bank, 2009, Neumark and Simpson, 2014). Some regionally-targeted public investment decisions might not fully consider externality on social returns and costs (Jarowski and Kitchens, 2016, De La Fuente and Vivis 1995, Crescenzi and Rodriguez-Pose 2012, and Yu et al 2012).

### E. Illustrative Exercise

The scenarios consist of giving a lump-sum cash transfer to selected households in a country.

**Existing programs** consist of progressive tax and transfer that brings the market income ( $Y_{mkt}$ ) to disposable income ( $Y_d$ ), with the corresponding inequality measure as the Gini coefficient denoted as  $G(Y_{mkt})$  and  $G(Y_d)$ , respectively. The fiscal redistribution effect is measured by the difference between Gini-coefficient before and after taxes and transfers  $G(Y_{mkt})-G(Y_d)$

$$Y_d = Y_{mkt}(1 - \tau(Y_{mkt})) + T \quad (4)$$

where  $\tau(Y_{mkt})$  is a progressive tax and  $T$  is the current transfers. The fiscal cost can be denoted with the function  $F(\tau, T)$  with taxes and transfers as parameters.

**Scenario 1.** A *spatially-blind universal transfer* for all individual households would imply an additional transfer of  $T'$  for all households nationwide (i.e., integrating all across households). The aggregate income will be:

$$Y_{Univ} = \int_i Y_d(i) + T' di \quad (5)$$

The size of the transfer is set to be 25 percent of median equivalent household income after tax. The fiscal redistributive impact will therefore be expressed as  $G(Y_{mkt}) - G(Y_{Univ})$  and fiscal cost  $F(\tau, T, T')$ . The cost effectiveness of the program can be measured  $[G(Y_{mkt})-G(Y_{Univ})] / F(T')$ .

A *spatially-targeted lumpsum transfer* would target all households residing in low-income regions, defined as those in the two lowest bottom income deciles. Integrating across all individuals nationwide would involve:

$$Y_{reg} = \int_{i|\bar{y}(j)\leq B} Y_d(i) + T' di + \int_{i|\bar{y}(j)>B} Y_d(i) di \quad (6)$$

where  $\bar{y}(j)$  is the average regional income level in region  $j$ ,  $B$  is the policy threshold. A spatially-targeted lumpsum transfer is given to households in regions with the lowest regional average income level less than the policy threshold  $B$ —set to be the lowest bottom two deciles of income. The cost effectiveness of the transfer is measured by  $[G(Y_{mkt})-G(Y_{reg})]/F(T', B)$ .

**Scenario 2.** *The spatially-blind means-testing transfer with imperfect coverage* would involve a cash transfer to those who are below a certain income threshold (i.e., households in the bottom two deciles by nationwide income classes).

$$Y_{MT} = \int_{i|Y_{mkt}(i)\leq Y_p} Y_d(i) + T'(1-\alpha) di + \int_{i|Y_{mkt}(i)>Y_{20}} Y_d(i) di \quad (7)$$

where  $Y_p$  is the income threshold of low-income households of the transfer program (e.g., bottom two deciles will be  $Y_{20}$ ). The imperfect coverage is denoted as the leakage ( $\alpha$ ) of the cash transfers  $T'$ . The fiscal redistributive impact is  $G(Y_{mkt})-G(Y_{MT})$ , while the cost effectiveness is scaled by the fiscal cost as  $[G(Y_{mkt})-G(Y_{MT})]/F(T', \alpha, Y_{20})$ .

*The spatially-targeted transfer with means-testing* would involve a cash transfer to those who are below a certain income threshold *and* reside in regions with the lowest regional average income level less than the policy threshold  $B$ .

$$Y_{MTreg} = \int_{i|Y_{mkt}(i)\leq Y_p \& \bar{y}(j)\leq B} Y_d(i) + T' di + \int_{i|Y_{mkt}(i)>Y_p \text{ or } \bar{y}(j)>B} Y_d(i) \quad (8)$$

The fiscal redistributive impact will be the difference of Gini coefficients, denoted as  $G(Y_{mkt})-G(Y_{MTreg})$ . The cost effectiveness can then be scaled by the fiscal cost as  $[G(Y_{mkt})-G(Y_{MTreg})]/F(T', B, Y_{20})$

The exercise scales the fiscal cost in each type of transfers to 1 percent of GDP for comparison across programs that have different coverage, income thresholds, and spatial thresholds (Table 5 in the main text). There is a tradeoff between the leakage of means-testing ( $\alpha$ ) and the concentration of low-income households within the regional threshold. Higher coverage of means-testing (i.e., lower leakage) would favor spatially blind means-testing while higher concentration of poor in the low-income regions would favor spatially targeted redistribution.

**Financing.** If the new spatially-targeted lump-sum cash transfer is financed by substituting current programs, the net improvement or deterioration of fiscal redistribution can be obtained by  $G(Y_{mkt})-G(Y_{reg})/F(T', B) - [G(Y_{mkt})-G(Y_{current})]/F(.)$ .

**Calibration.** We use the latest year of individual household surveys from LIS database for five countries and calibrate the lump-sum transfer to be 25 percent of the median equivalent household income nationwide before taxes. The imperfect coverage varies by countries ranging from 46 to 83 percent observed in the data (IMF 2017 Table A.1.6) and considers variants of the parameters from 60-90 percent. For means-testing transfers, the income threshold is set at the bottom two deciles by income class (i.e.,  $Y_p = Y_{20}$ ) and considers regional-targeted transfers for the regions with average household income between 40<sup>th</sup> to 60<sup>th</sup> percentile of the average income distribution across regions.

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