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Place-Based Policies and Spatial Disparities across European Cities

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Spatial disparities in income and worklessness across areas of the European Union are profound and persistent. Concerns about these disparities, and the appropriate policy response, are longstanding. Two trends have re-energized popular and academic debate. One is economic: on some dimensions, disparities have stopped narrowing and started to grow. The other is political: some argue that persistent disparities cause discontent and help explain the rise in populist movements (Rodriguez-Pose 2018).

We focus on disparities in income and worklessness across EU metropolitan regions, commonly called "metros," using new definitions from OECD and Eurostat. As these metros account for around two-thirds of population, and larger and growing shares of employment and GDP, their economic performance is crucial for understanding EU disparities. Focusing on them also narrows down the area-based policies that are relevant. It means we have less to say about rural-urban disparities which involve different economic mechanisms and policies.

Our metro definition is based on the so-called NUTS3 regions, which divide up Europe into areas of 150,000 to 800,000 people. Our data combines these areas into metro regions: groups of NUTS3 sharing a common labour market and meeting a minimum size threshold. We focus mostly on the "EU-15", which is the group of 15 countries in the EU at the end of 2003, before the EU expanded to central and eastern Europe. We also offer some comparisons to the "EU-28", referring to the total number of EU countries before the departure of the UK, and to the US economy.

We begin by providing evidence that differences in GDP per capita across EU-15 metros converged in the 1980s, stabilized in the 1990s and early 2000s and have been diverging since the mid-2000s. We also show diverging patterns of worklessness.

We then turn to research in urban economics for a theories and empirical evidence that help explain the factors driving these disparities. We will show that bigger cities pay higher wages (the 'urban wage premium') because they make workers more productive. They also tend to attract more educated workers who are more productive and earn more. As a result, GDP per capita is higher in bigger cities. These two factors reinforce one another, because the urban wage premium increases with education. Both factors play a role in the EU in explaining the level and evolution of spatial disparities. We provide evidence that real estate costs increase with city size, with implications for real wage inequalities and whether area-level improvements in productivity capitalize into higher house prices. We also explore low mobility rates in Europe, and differences in labour market regulations, which help explain why employment disparities are more pronounced than for income.

Do these profound spatial disparities justify place-based policies aimed at reducing them (Austin et al 2018)? Neumark and Simpson (2015) provide a useful overview of the literature on place-based policies. We focus on several policies which directly target spatial differences. Our emphasis is on policies that work at broad spatial scales. We argue that it is important to differentiate between policies as they operate via different mechanisms and yield different trade-offs between spatial inequality and aggregate efficiency.

We start with EU cohesion policy. These convergence transfers appear to have fostered growth in supported areas and thus reduced income disparities, but the effects vary considerably across areas with the positive effects driven by areas with high human capital and high-quality local government. The evidence also finds decreasing returns from transfers. The changes in disparities over time suggest that the economic forces swamp the impact of EU policy. We then consider two major items of expenditure within total cohesion policy spending: transport and support for firms from capital subsidies. Finally, we consider enterprise zones and local employment multipliers for different kinds of private and public sector employment.

Europe has a long tradition of using place-based policies to support lagging regions and to address local downward spirals following structural change. While place-based policies did not prevent increasing disparities in Europe, they may have modestly mitigated them.

The Evolution of Spatial Disparities across European Cities

A comprehensive literature discusses regional disparities in Europe. Much of this uses data on "NUTS2 regions" of 800,000 to 3 million inhabitants which also determine eligibility for the main EU structural funds. In contrast, we use data on metro regions. As argued above, one reason for this is the economic importance of these metros, and their role in driving EU spatial disparities.

The other reasons for using metros are analytical, but important. The economic literature on spatial disparities emphasizes the need to think about the appropriate spatial unit. For example, functional urban areas tied together by flows of people and goods should be used to think about local labour markets. But, for many EU countries, NUTS2 regions do not approximate functional urban areas. For example, London is split into five NUTS2 regions and merging just these regions—so that the London metro is a single geographic unit—changes one commonly used measure of dispersion across the EU-15 by 29 percent. Moreover, NUTS2 cover disparate areas: comparing London, Paris, and Munich, with the agricultural areas of Ireland, the beaches of Andalusia and the mountains of Tyrol. The economic theories that explain disparities across cities, countryside, beaches, and mountains are broad. Such breadth also widens the relevant place-based policies.

For these economic and analytical reasons, we focus on spatial disparities across metropolitan regions ('metros') using the recent EC/OECD specification (OECD 2019).[1] As described in the introduction, our data defines metros using NUTS3, or aggregates of NUTS3. For the EU-15 in 2015 (the latest date for which there is data), there are 226 metros with a minimum population of 250,000 and a maximum of 13.9 million. For the broader EU-28, we have 279 metros. In 2015, metros account for 64 percent of the population in the EU15 (60 percent for the EU-28), and a higher share of employment and GDP.

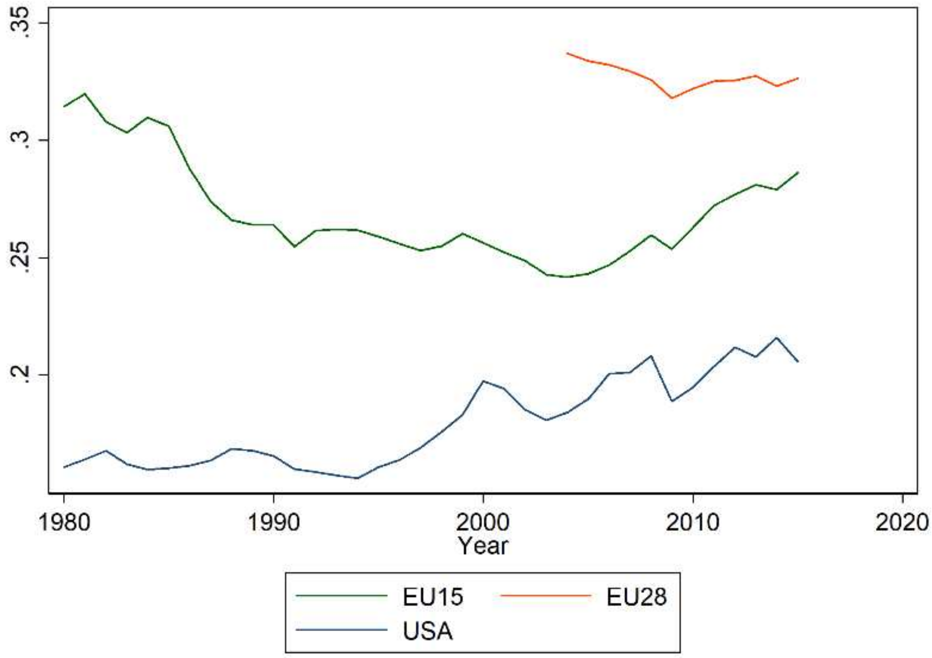
One important headline indicator of disparities, because it determines eligibility for the main EU Cohesion Policy funds (discussed in detail later), is whether a NUTS2 region has GDP per capita less than 75 percent of the EU average. Applying this indicator to EU-15 metros, 32 of 226 metros, home to 12.5 percent of the metro population, are below 75 percent of the average GDP per capita. For the EU-28, the corresponding figures are 51 out of 279 metros and 14 percent. In the US, a similar proportion of metro areas (70 out of 384; as defined by the US Bureau of Economic Analysis) have per capita GDP that is 75 percent or less of the national average but account for only 7 percent of the metro population. In the EU, people are much more likely to live in poorer metros than in the US. This hints at the role mobility plays in understanding EU disparities.

The coefficient of variation— the standard deviation divided by the mean—is a standard measure of dispersion. Figure 1 plots the (unweighted) coefficients of variation of GDP per capita across EU-15, EU-28 and US metros over the last four decades. In 2015, the coefficient of variation was 0.28 for the

[1] The online Appendix provides information on data sources, descriptive statistics and additional figures. It also provides a more detailed discussion of disparities across NUTS2 regions.

EU-15, 0.33 for the EU-28. EU disparities appear to be higher than US, although the coefficients of variation are not directly comparable: for the US we used income (not GDP) per capita and Bureau of Economic Analysis (BEA) metros, rather than the OECD definition. We experimented with using BEA data, weighted by area shares, to approximate the OECD metro definition. However, the approximation is imprecise, so we focus on comparing trends rather than levels. The appendix provides a figure using comparable OECD metro area definitions applied to the US (for a shorter time period), which shows that the coefficient of variation for the EU15 metros is 15% larger than for the US (see Figure A1). These differences are bigger if we include non-metro areas as the least productive rural areas in the EU are less productive (relative to the EU mean) than the least productive rural areas in the US (relative to the US mean).

Figure 1
Coefficient of Variation of GDP per capita – EU15, EU28 and US Metros



Source: Authors
Notes: Calculations based on Eurostat and BEA data and metro definitions as described in the text. EU15 and EU28 calculations use GDP per capita; US uses income per capita.

Variation across EU-15 and EU-28 countries explains around half the coefficient of variation for metro areas —44 percent and 50 percent, respectively (based on decomposing the squared coefficient of variation). EU-15 disparities fell in the 1980s, stabilised in the 1990s, fell again in the early 2000s, then increased from the mid-2000s and markedly after the double dip recession. For the EU-28 the coefficient of variation fell somewhat when new members joined and then remained at similar levels until 2015.

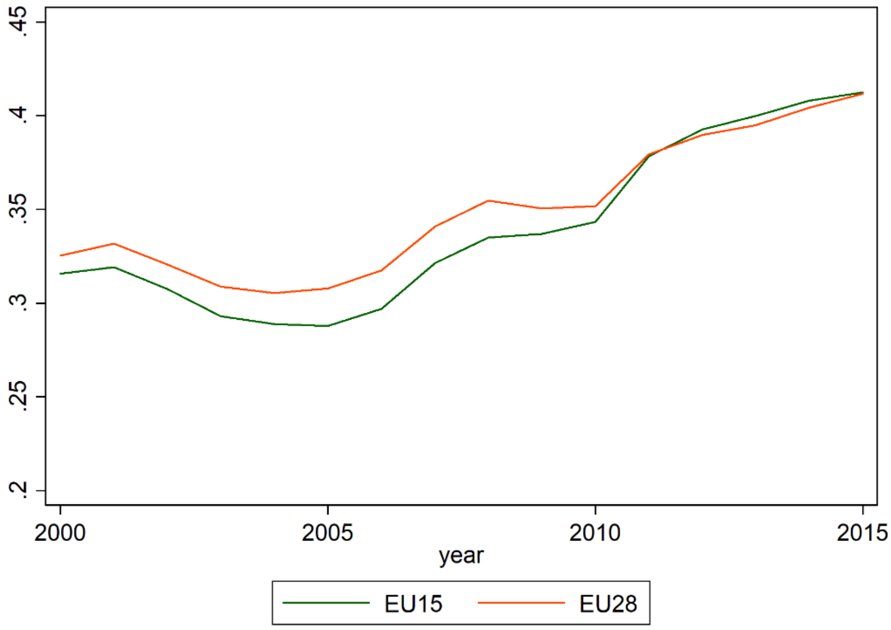
Disparities in income per capita across US metros started widening around 1995, roughly a decade before the EU-15. But since about 2004, the trends are relatively similar. From their lowest value in 2004, EU-15 disparities have increased by 18 percent, compared with 12 percent in the US over the same period). For the EU28, we observe a much higher level of disparities, but the short time series makes it hard to assess the longer run trend, which is why our focus is on the EU-15.

This rise in inequality across metros is especially striking because it follows a longer period of convergence across European regions in per capita income. Rosés and Wolf (2019) provide estimates of regional GDP per capita for a mixture of NUTS 1 and 2 regions (excluding Greece), and show a 31 percent decrease in the coefficient of variation between 1950 and 1980.

Another measure of convergence focuses on whether on average poor metros grow faster than rich metros by regressing growth rates of GDP per capita on initial levels, where the regression coefficient measures the extent to which regions are moving toward the mean level of per capita income (often referred to as beta-convergence.) Running such regressions for 1980-2015 or for 1990-2015, we find evidence of significant mean-reversion, but for 2005-2015, we find divergence instead (see Figure A2). Such findings reinforce the message that a longer-term pattern of mean-reversion of per capita income across the EU-15 has stalled and even reversed itself. This is similar to results for US states (Ganong and Shoag 2017) although mean-reversion ended around 15 years before it did in the EU.

Figure 2

Coefficient of variation of worklessness – EU Metros



Source: Authors

Notes: Metro definitions as defined in the text.

Other measures of economic performance show similar patterns. The rates of employment and worklessness (that is, of not working in the working age population) also vary substantially. As shown in Figure 2, for EU-15 metros, the coefficient of variation of worklessness increased from 0.31 in 2000 to 0.41 in 2015. Over the same period the level and trend are similar for the EU-28.[2] This variation in worklessness has been of long-standing interest in Europe and is receiving increased attention in the US. For example, Austin et al. (2018) show that US disparities in worklessness rates are pronounced and have increased in the last decade.

[2] For the EU-28 there is a longer time series of data on worklessness than there was for GDP per-capita so we can look at the evolution over the same time-period as for the EU-15. Regressing the rate of worklessness in 2015 on the rate in 2005 gives a slope of 1.19 for EU-15 metros, suggesting that, as for GDP per capita, the recent past has seen divergence of worklessness. The same regression gives a coefficient of 1.07 for the EU-28.

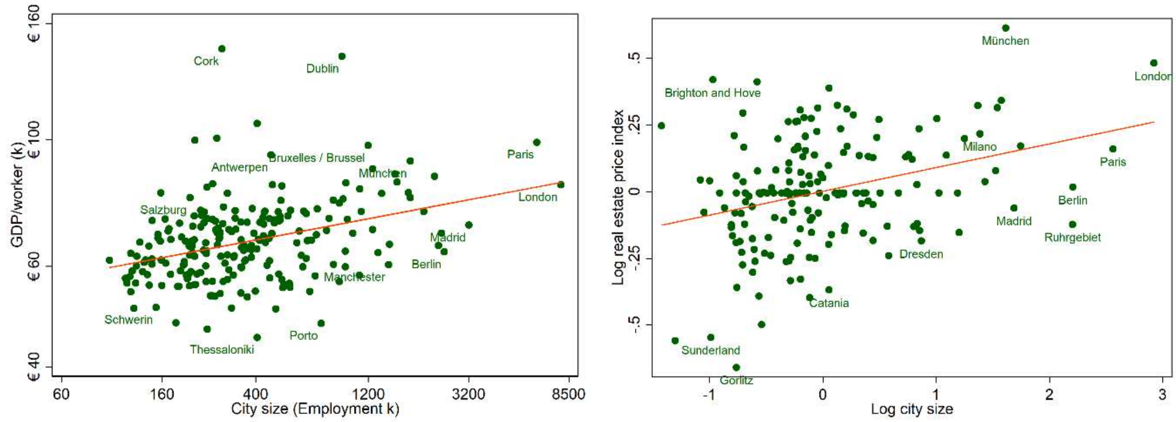
Disparities in EU worklessness rates are more pronounced than those for GDP per-capita: the coefficient of variation for per-capita GDP in 2015 is 0.28 and for worklessness 0.41. As with GDP per capita, variation in per country worklessness explain around half the total variation (51 percent).

What Causes Geographical Disparities in Europe?

EU metros exhibit wide and persistent disparities in GDP per capita and in worklessness, and these disparities appear to be widening. To understand these disparities, the standard approach in urban economics is to think about firms and workers trading off productivity advantages of different cities against the costs of locating in those cities. (Urban amenities may play a role, too, but we sidestep that issue.)

Figure 3

Agglomeration and Urban Costs – EU metros



Panel a) Agglomeration elasticity

Panel b) Urban cost elasticity

Source: Authors.

Note: City size is number of workers in panel (a) and population in panel (b). For panel (a) given variations in worklessness, we use GDP per worker and number of workers, rather than GDP per capita and population. Panel (b) uses data for France, Germany, Italy, Spain and the UK and includes country fixed effects to account for differences in real estate price indices. Deviations in the log real estate index from the country mean are on the y-axis, deviations in log populations from the country mean are on the x-axis. Panel (a) uses data from 2015, panel (b) from 2011 (Italy has no 2015 data). Results are robust to using 2015 and excluding Italy. For details, see the online Appendix.

Metro Disparities in Productivity and Land Prices

A substantial literature suggests urban size is an important source both of productivity advantages and of higher congestion and land costs. As an illustration, Figure 3 shows that city size is positively associated with GDP per worker and real estate prices. For 2015, regressing the log of GDP per worker on the log of city size gives an elasticity —the slope of the line in the figure — of 0.077. For the real estate index in 2011, the elasticity is 0.930.[3]

Because of the considerable wage premium earned by "college educated" the relationship of GDP per capita with city size overstates productivity benefits if workers sort across cities so higher

[3] This second elasticity looks low compared to country-level estimates reported in Ahlfeldt and Pietrostefani (2019). This is not surprising given that we pool together quite different data.

educated live in bigger more productive cities (as argued in Combes et al. 2008). We see such sorting in our data: Regressing metro GDP per worker on the share of population with tertiary education and absorbing country fixed effects gives a coefficient of 0.015 (i.e. a 1 percentage point increase in the share educated increases GDP per worker by 1.5 percent).[4] Individual country-level studies control for such sorting on both observed characteristics (e.g. share college educated) and unobserved characteristics (e.g. share high ability) using individual panel data—that is, following specific workers over time. Unfortunately, no such panel data is available for the EU-15. However, if we re-estimate the relationship between GPD per capita and city size controlling for the share tertiary educated, the elasticity falls from 0.077 to 0.069.

Sorting and city size reinforce one another because more educated people live in more productive cities. Using US data, Moretti (2013) shows that the college wage premium is larger in big cities, a result we can replicate using less detailed individual level data from the EU.[5] The assortative matching of firms and workers may partially explain this effect (for discussion, see Card et al. 2013; Dauth et al. 2019).

Explaining the Changes in Disparities over Time?

If variations in city size and in the composition of educated workers help explain disparities across EU-15 metros, can a simple urban model also explain the changes over time?

Table 1 suggests a partial answer by looking at how the estimated elasticity of GDP per worker changes over time with respect to metro size. As convergence slowed, and then reversed the size-elasticity increased markedly. In column 2, we control for sorting using the share of population with a tertiary education, in periods when we have data. This has a relatively small effect on the agglomeration elasticities, although the effect does seem to be increasing over time. It is difficult to be precise because of the measurement error introduced by the way we must calculate tertiary education shares (see footnote 6).

[4] Tertiary education data is only available from 2000 onwards for NUTS2. We compute the shares for metros by assigning each NUTS3 the corresponding NUTS2 education shares. For 14 metros, which only have data from 2005 on, we impute shares using a model with metro fixed effects and a linear time trend.

[5] Using data from the EU Statistics on Income and Living Conditions (EU SILC), we run Mincer-style regressions including a city residence indicator interacted with a tertiary education indicator. The positive coefficient on the interaction suggests a higher tertiary education premium in cities (see Table A3). Grujovic (2019) provides similar evidence with German data. Regressions using the EU SILC data show the high-skilled are 9.5 percent more likely to live in a city than the average and the effect has been increasing somewhat since the start of the data in 2005 (see Table A4).

Table 1
Agglomeration elasticity: EU-15 Metros

Year	Agglomeration elasticity	Agglomeration elasticity conditional tertiary education share
1980	0.0429 (0.0260)	.
1990	0.0517 (0.0175)	.
2000	0.0778 (0.0136)	0.0764 (0.0135)
2010	0.0835 (0.0122)	0.0791 (0.0123)
2015	0.0774 (0.0132)	0.0686 (0.0134)

Source: Authors
Note: Coefficients from regression of log GDP per worker on log number of workers controlling for share tertiary educated (column 2). Standard errors in parentheses.

We can look more directly at sorting by considering changes in the "college educated" wage premium and in the spatial concentration of skilled workers. For some EU countries, the university graduate premium has increased (Machin and van Reenen 2007; Dustmann et al. 2009) which directly increases disparities between smaller and bigger cities as the latter employ more highly educated workers.

Changes in the spatial concentration of highly educated workers reinforce the increase in the "college educated" wage premium. In EU-15 metros, the share of population with a tertiary education increased by about 10 percentage points between 2000 and 2015. This increase was not equally distributed across metros. Regressing the log growth of tertiary education shares on the log of initial population and including country fixed effects shows that a 10 percent increase in initial metro population is associated with a rise of 13.6 percent in the share tertiary educated over the period (see Figure A3). That is, we see increased sorting of the more educated population consistent with US evidence (Moretti, 2004 and Berry and Glaeser, 2005). This increasing concentration of more educated workers is reflected in increased concentration of skill-intensive employment. For example, using patents as a proxy for skill-intensive employment, we see increased spatial concentration between the early 1990s and early 2010s (see Figure A4).

What explains the increasing concentration of more educated workers in big cities? One factor is the shift from manufacturing to knowledge-intensive services: the employment share of knowledge intensive services and high technology manufacturing increased in the EU from 2000-15 by around. 16 percent. This shift was caused by a mixture of increased globalisation (like the "China shock," as in Autor et al., 2013; Dauth and Suedekum, 2016) and technological change and increased automation (Acemoglu and Restrepo 2019; Dauth et al. 2019). As knowledge-intensive services employ more educated workers and benefit from higher agglomeration economies this structural shift should see increased concentration of more educated workers in big cities.

An inelastic supply of housing in growing and more productive metros also plays a role. High house prices prevent the poor, who spend a higher income share on housing, from moving to more productive areas (Ganong and Shoag 2017). In some EU metros, land use constraints are highly restrictive and increase house prices (Hilber and Vermeulen, 2016). For the EU countries in our data, real estate price increases are particularly pronounced in places with high initial GDP per worker (see Figure A5). For the US, Hsieh and Moretti (2019), estimate the aggregate GDP costs of the spatial misallocation resulting from such land use constraints, but no estimates are available for the EU.

Spatial Disparities in Worklessness

As is well known, differences in labour market institutions play an important role in explaining country variation in worklessness (in this journal, Siebert 1997). These institutions may also help explain why spatial disparities in worklessness are more pronounced. For example, nationally set minimum wages could increase worklessness in poorer areas: evidence for Germany suggests this happens in some low wage areas (Ahlfeldt et al 2019). Even without binding minimum wages centralised wage bargaining may be a driver of spatial disparities in worklessness as such schemes prevent the adjustment of wages to regional productivity differences. Comparing Italy and Germany, Boeri et al. (2019) argue that centralized wage bargaining in Italy translates similar spatial variations in productivity into much smaller variation in nominal wages, but much bigger variations in worklessness. Our results confirm the important role of labour market institutions: regressing metro worklessness rates against GDP per worker, we find a negative coefficient which is more than twice as large for countries with more centralized wage bargaining.[6]

Mobility and Spatial Disparities

According to Molloy et al. (in this journal, 2011) mobility in 2005 was significantly higher in the US than in the EU, which contributed to higher EU disparities. In contrast to the US where mobility rates have been falling, the EU trend is less clear and mobility may have been increasing (EU Commission 2018). Fischer and Pfaffermayr (2018) suggests that labour mobility plays a small role in reducing EU disparities in per-capita GDP. Unfortunately, this increased mobility took place against a background of increasing concentration of economic activity and sorting of high skilled towards big cities. There is also some evidence that regional transfers may slow down the adjustment that occurs via mobility (Egger et al. 2014; Jofre-Monseny 2014).

Place-based policies

So far, we considered factors that explain disparities across EU metros and why these areas have stopped converging and started to diverge. The rest of the paper considers place-based policies. We consider policies that *explicitly* target the spatial allocation of economic activity. We will not discuss general national-level policies like schools funding, employment training, and others that directly target outcomes like education that matter for spatial disparities, but aren't necessarily designed to target the issue of divergence. We focus on what we know about the impact of these policies on specific economic outcomes such as employment and how this depends on the economic forces driving spatial disparities that we discussed above.

These forces also affect the equity and efficiency of place-based policies. In distributional terms, the effect of policy will be partly determined by the mobility of individuals living in the area targeted and the housing supply elasticity (Kline and Moretti 2014). For example, with relatively elastic supply of labour across metros, but an inelastic housing supply, local benefits of spatial transfers are realized

[6] Conditional on country fixed effects the effect of log GDP per worker on non-employment rates is -0.21 in the group of countries with more flexible regional wage bargaining (AT, DE, DK, NL, SE), -0.57 in the group with less flexible, more centralized wage bargaining (BE, FI, FR, IT, PT, SI) Both coefficients are significant at the 1 percent level.

by landlords as they capitalize into land prices. Firm and household mobility also increases the risk that if policy induces significant local employment effects in targeted areas, these may come at the cost of employment losses elsewhere. Displacement from richer to poorer metro areas will presumably narrow disparities. The effect on overall output depends on whether agglomeration economies in targeted areas outweigh potential losses in non-targeted areas. Shifting investments and jobs from prosperous, productive areas to lagging, less productive regions is likely to generate aggregate efficiency costs. The effect of displacement on aggregate welfare depends on equity considerations and also how it affects congestion externalities: for example, if displacement from richer to poorer cities reduces both congestion and agglomeration externalities, the net effect might decrease productivity, but increase welfare (for example, Fajgelbaum and Gaubert, 2020; Henkel et al. 2018). It is unlikely that policy-makers have enough information to account for this potential mixture of externalities (Kline and Moretti, 2014).

EU Cohesion Policy

Reducing spatial disparities in income and worklessness is a long-standing EU objective. Interventions directly funded by the EU include investments in transport infrastructure and in local public goods and services, a mix of firm subsidies and human capital investments including employment training. There are three main funds: The European Social Fund, the European Regional Development Fund, and the Cohesion Fund. Other smaller funds also partly target less developed regions.

The cohesion policy budget for 2014-2020 is €645 billion (for a detailed description, see https://cohesiondata.ec.europa.eu/). Total expenditure is around one-third of the EU budget, which is small relative to total government expenditure. That said, the impact of EU policy is greater than this suggests, because EU state aid rules restrict policy in member states. The lion's share of the budget (60 percent) goes towards 'less-developed' regions, with GDP per capita less than 75 percent of the EU average. Investments in transport infrastructure, research and development, and business support are the main expenditure categories accounting for 45-50 percent of the budget.

Various arguments are used to justify EU cohesion policies. One approach takes equity arguments used to justify policies to reduce disparities within nation-states and extends these to an EU-wide policy. For example, if all EU citizens should be entitled to similar public goods, EU policy may be justified as helping to equalize fiscal capacity.

From an efficiency perspective, cohesion policy could lead to higher aggregate output if there are diminishing returns to public investment, so that investing in areas with lower levels of public investment will produce larger gains. Or the EU might play a federal role coordinating investments that exert cross-area externalities. Or EU transfers may mitigate externalities from fiscal competition among jurisdictions.

An alternative argument makes the case for cohesion policies as a tool for advancing European integration. For example, transfers may build acceptance of the EU in new member states. This may be important if integration generates economic growth at the centre at the expense of peripheral regions (Puga 2002) or if wealthier areas can set higher taxes because firms' desire to locate there reduces tax competition (Brülhart et al. 2012).

The effects of EU cohesion policies have been studied extensively. Clear eligibility criteria, strictly applied and largely unchanged since 1989, allow for a (quasi-)experimental situation in which NUTS2 regions with GDP per capita slightly below the 75 percent threshold receive substantial transfers and can be compared to regions slightly above the threshold that do not. Becker et al. (2010) use this threshold to identify the effect of transfers using a regression discontinuity design. On average, transfers appear to have been effective in fostering growth in recipients and thus reducing disparities (Becker et al. 2010, Mohl and Hagen 2010, Pellegrini et al, 2013, Giua 2017).

However, the effects vary considerably across areas depending on local conditions. The positive effects are driven by regions with high human capital, as measured by education of the workforce, and high-quality local government, as measured by survey data about public services (Becker et al. 2013). Transfers are ineffective elsewhere. One potential reason is that while member states agree strategy and budgets, selection of projects is done by regional authorities. Lower-quality local governments may choose ineffective policy. Or worse, may be more susceptible to increased rent-seeking activities and white-collar crime (Accetturo et al. 2014; de Angelis et al. 2018).

The empirical evidence also suggests decreasing returns from cohesion transfers. Becker et al (2012) and Cerqua and Pellegrini (2018) estimate the effects of transfer intensity (defined as transfers relative to local GDP). Their results imply that the marginal treatment effect declines with higher intensity and becomes zero at some "maximum desirable treatment intensity." One explanation is that limits to institutional capacity mean that additional subsidies are used with increasing inefficiency. Alternatively, the returns to investment may decrease in a way consistent with a neoclassical aggregate production function so even high-quality governments see decreasing returns. The literature does not discriminate between these two explanations.

Finally, a key question is whether transfers lead to a temporary or permanent improvements. The evidence is inconclusive, but raises doubts that effects are long-lived. For example, case studies of the Italian Abruzzi region and the UK's South Yorkshire region, which lost eligibility in 1996 and 2006 (respectively) suggest improvements were temporary (Barone et al. 2016; Di Cataldo 2017). Becker et al. (2018) look at all areas which lost eligibility, finding on average reversion to pre-transfer trajectories once funds are cut.

The findings raise several questions about ways to improve cohesion policy. For example, should the EU allow for a longer transition period when areas become ineligible for subsidies? Are transfers well-targeted at investments that improve long-run growth? Given the importance of human capital to the effectiveness of subsidies —both directly in labour markets and indirectly through improving local institutional quality—perhaps human capital should be a higher priority than, say, infrastructure? Similarly, given that effectiveness decreases as transfers increase, would it make sense to transfer some subsidies from regions with a higher ratio of subsidies to GDP to regions with a lower ratio?

All the evidence is for regions rather than metros. Given the economic importance of metros and the difference between urban and rural economies more should be done to understand the differential impacts of cohesion policy. As metros are on average more highly educated, and human capital and GDP per capita matter for effectiveness, the efficiency of the funds may be increased by targeting metros that are relatively high skilled compared to surrounding regions. At the same time, the increased sorting of more educated workers means that declining areas, which are losing their more educated labour force, will also be less able to transform transfers into growth. This raises questions around place-based policies that target skilled labour, an issue to which we return below.

So far, we have focused on the overall effect of EU cohesion policy considering the effects of transfers consisting of a bundle of interventions. Blouri and Ehrlich (2020) find that there is significant variation across interventions in their effects. Thus, we next consider the impact of different policies, drawing on cross-EU studies and papers looking at national policies.

Transport Infrastructure

A substantial share of EU cohesion spending is on transport infrastructure: 18 percent in 2014-20, down from 25 percent in 2007-13. Nation-state infrastructure investment is many times larger. One way of thinking about infrastructure projects is as a public capital input that makes firms more productive (Aschauer, 1989). This assumes decreasing returns to infrastructure investment, consistent with the findings for EU cohesion policy. More recent literature has emphasised the importance of thinking about the transport network. Changing the network affects firm access to goods markets and input factors and worker access to jobs. As these determine the relative attractiveness of places, infrastructure may affect the location of firms and workers, shaping the spatial distribution of activity. For an overview of theory and empirics on the impact of transport infrastructure, see Redding and Turner 2015.

Recent empirical evidence has looked at these effects using the impact of road investments. For example, looking at incremental changes in UK road infrastructure, Gibbons et al (2019) find substantial positive effects on area employment and number of establishments. While employment gains are largely driven by firm entry, some firm-level analysis also finds productivity increases for incumbent firms. Holl (2016) provides such evidence for improved highway access in Spain which also increased economic activity close to highways. These studies show sizable local effects but may not identify aggregate effects when improvements affect the entire network.

A central aim of the EU is to increase integration by lowering transaction costs, thus potentially causing fundamental changes in economic geography. For example, the Trans-European Network is a key project that aims to improve integration. However, there are long-running debates about the spatial effects of infrastructure in the "New Economic Geography" research (Krugman 1991; Fujita et al. 1999; Puga 2001; Baldwin et al. 2003) For example, the "two-way roads" problem points out that transport improves the access of firms in less developed regions to core markets, but also increases core firms access to less-developed regions. As a result, transport investments may increase or decrease industrial concentration. Overall, this literature suggests that the effect on spatial disparities depends on several factors: the reduction in trade costs, wage differences, congestion costs, and mobility.

Unfortunately, the two-region structure common in these earlier models proved hard to adapt to multi-region settings and complex transport networks.

More recent spatial economic models eliminate the possibility of multiple-equilibrium but more easily incorporate realistic multi-region geography (Allen and Arkolakis 2014; Redding and Rossi-Hansberg 2017). Once fitted to real world data, such models can assess the relative contribution of location, market access and local (perhaps innate?) productivity differences in explaining spatial disparities. They can also quantify the effects of changes to transport networks on the spatial distribution of employment, income and aggregate welfare while allowing for displacement.

Santamaria (2019) uses this approach to quantify the welfare effects of reshaping the West German highways network after World War II and finds that this generated large persistent income gains. Allen and Arkolakis (2019) derive a framework to compute the welfare impact of local infrastructure improvements in the presence of agglomeration and congestion externalities. Even without relocation, the welfare effects spread over the network through changes in price indices. Blouri and Ehrlich (2020) use a similar model to consider the general equilibrium impact of EU infrastructure investments. Investments increase local productivity and this, combined with reduced transport costs, generates significant aggregate welfare gains—but only a relatively small reduction in income disparities. The utility-maximizing distribution of investments suggests that funds should be redistributed towards more central regions and some border regions. Unfortunately, this redistribution is predicted to increase spatial income inequality, once again highlighting the trade-off between aggregate efficiency and spatial disparities.[7]

Can transport infrastructure investments explain the recent divergence across metro areas? Initial investments in the Trans-European Networks may have mostly completed national networks, and the associated increase in public capital stock could have driven between-country convergence in the 1980s. However, if later investment did more to complete the cross-country network or were targeted more to core areas, the contribution to convergence would be reduced.

Again, much of the available evidence considers regions rather than metros. These leaves questions about place-based policy that have not been widely addressed. If reallocating transport expenditure towards more central regions maximizes aggregate efficiency, would this also hold true within regions? Transport investment may also interact with educational composition: for example, public transport in big cities may attract more educated workers, thus helping explain increased sorting. This has not been studied for Europe as a whole, but Fretz et al. (2019) study effects of the construction of the Swiss highway network, showing that improved access for municipalities led to a significant increase in their share of high-income households.

Capital Subsidies and Enterprise Zones

Governments offer subsidies to specific firms, particularly in disadvantaged areas. Such subsidies raise two major concerns: the "deadweight" problem that they finance activities that firms would have undertaken anyhow; and the "displacement" problem that if subsidies encourage new activity in targeted areas, this may come at the cost of activity elsewhere.

Research seeking to understanding the deadweight and displacement effects from EU policies struggles with a lack of detailed data and substantial identification challenges (see e.g. Bachtrögler and Hammer (2018) and Beņkovskis et al. (2019).

Country-level studies have made more progress because one (unintended) consequence of EU state aid rules is that they induce exogenous variation to identify the impact of place-based capital subsidies. Some studies suggest that subsidies, if well designed, can alter firm behavior (i.e. not all the impacts are deadweight). For example, Criscuolo et al. (2019) look at the impact of the UK's Regional Selective Assistance scheme, which provided discretionary grants to manufacturing firms in disadvantaged areas. The rules governing area eligibility are determined by EU rules. Thus, changes in EU rules provide a source of exogenous variation for estimating the impact on employment, unemployment and other firm outcomes. Subsidies have large and statistically significant effects: increasing area level manufacturing employment and decreasing unemployment. These effects are driven by small firms. Similar strategies have been used for other place-based capital schemes including the GRW in Germany (Brachert et al. 2019; Etzel et al. 2020) and Law 488/1992 in Italy (Bronzini and de Blasio 2006). The results are not always positive. Bronzini and de Blasio (2006) find evidence of substantial deadweight and displacement: subsidized firms bring forward investment projects and gains may come at the expense of non-subsidized firms.

[7] Further welfare gains can be realized by supra-national coordination of infrastructure—for example, if governments ignore foreign consumers when deciding on investment in border regions (Felbermayr and Tarassov 2019).

Enterprise zones, in most incarnations, offer a broader set of subsidies (not just capital subsidies), some of which may offer indirect support to firms (like relaxation of planning regulations), but in a specific area often much smaller than a metro area. Most of the literature on enterprise zones comes from the US (Neumark and Simpson provide a summary), but a small literature considers the effect of European schemes, particularly the French Franches Urbaines (for example, Briant et al. 2013; Mayer et al. 2017; Givord et al. 2013; Gobillon et al. 2012).

One difference that emerges is that US enterprise zones have larger impacts on area unemployment, which may reflect the fact that some US schemes impose "local hiring conditions," (usually that a certain percentage of workers must live locally) which are not used in Europe.

Another difference is that deadweight and displacement concerns are more pronounced for enterprise zones than for place-based capital subsidies operating at broader spatial scales. One explanation is that the latter are often selective. For example, to be eligible to receive UK Regional Selective Assistance, a firm must demonstrate that it does *not* predominantly serve local markets. Such a requirement may reduce displacement compared to enterprise zones that provide non-discretionary subsidies to all firms within the zone. A second explanation is that a firm relocating to an enterprise zone within the same metro can access the same local labor markets and do business with existing customers and suppliers. In the absence of a local hiring requirement, it can even employ the same workers. This creates large incentives to re-locate within metros. In contrast, firms relocating to take advantage of other place-based capital subsidies may need to move to different local labour markets and face differential access to customers and suppliers.

We have little evidence on the efficient spatial allocation of these area-based initiatives. As one example, Gaubert (2019) studies the location choice of heterogeneous firms when offered firm subsidies to locate in difference size cities. In the model (calibrated to the French ZFU programme), firm subsidies in small, less productive cities lead to displacement which has negative effects on aggregate productivity. Transfers to large, productive cities increase aggregate productivity.

The effects of these policies on spatial disparities will be modest. If the findings for UK Regional Selective Assistance generalize, selective (capital) subsidies may reduce disparities in worklessness but not GDP per capita. For the scale at which enterprise zones operate, and given the findings on displacement, it is unlikely that these have much impact on metro disparities in the EU.

Local Employment Multipliers

Firm-level subsidies aim to support employment at an individual firm, or to attract new employers to an area. This should directly increase local employment, providing that subsidised employment does not displace existing jobs. This increased local employment may generate additional jobs by increasing productivity (as in Greenstone et al. 2010) or demand for locally produced goods and services. These positive "multipliers" may be offset by general equilibrium effects that increase local wages or prices.

The literature on local multipliers assesses the net effect on local employment. The evidence considers multipliers from three kinds of employment: in tradable sectors (that sell mostly outside the local economy); in tradable skilled and high-tech sectors; and in the public sector. The multiplier for jobs in tradable sectors on jobs in non-tradable sectors is the most frequently estimated. Estimates for Italy, Spain, Sweden, and the United Kingdom differ, although are broadly in line with US estimates. These suggest that an additional tradable job creates between 0.5 and 1.5 extra jobs in the non-tradable sector. A smaller number of studies provide estimates for high-tech or high-skilled tradables, generally finding larger multipliers (again, consistent with US evidence).

The fact that these multipliers are higher might provide an additional justification, over and above the direct effect on innovation, for policies that support the clustering and collaboration of firms in R&D-intensive sectors. However, evidence on the effectiveness of these policies is mixed. For example, for Germany, Falck et al. (2010) document positive effects on innovation, whereas Martin et al. (2011) and Falck et al. (2019) tend to find no effects on regional employment in France and Germany, respectively. Moreover, these studies ignore the negative aggregate effect of spreading out activities that may benefit from large agglomeration economies. It also ignores the possibility that price effects, like higher prices of housing, may outweigh any employment effects for the lower skilled (Lee et al. 2018).

Decisions about public sector employment allow governments to affect the spatial allocation of employment directly. For example, central government employment is usually concentrated in the capital city. Re-allocation of public sector employment from richer to poorer areas provides a direct mechanism for reducing disparities.

Some studies estimate multiplier effects for these public sector jobs (Faggio and Overman 2014). The What Works Centre for Local Economic Growth (2019) identified six such studies. Results are mixed, with two finding negative effects on private sector employment (that is, crowding out), one finding no effect, and three finding positive multipliers. Two of these three report crowding out for manufacturing, offset by a positive multiplier on services. Increases in wages or house prices seem to underpin these crowding out effects. Overall, estimated public sector multipliers are smaller than private sector. One explanation is that public sector employers may have weaker input-output linkages with local firms. Another is that salaries are relatively high in relocated public sector jobs, consistent with both larger price effects on wages and housing and higher levels of crowding out.

Conclusion

EU Spatial disparities are profound, persistent and may be widening. Thinking about the role of metros and the sorting of workers helps better understand these disparities and the effect of different policies and complements the extensive literature on regional disparities. The findings that EU support is more effective in higher educated regions, on the intensity of transfers and the impact of transport raise questions about whether funds should be targeted more at metros. Regardless of the intervention, our understanding of many place-based policies is improved if we think about the effects from a metro perspective.

Our discussion has raised several questions without answering them, and here is one more. At least as far back as Akerlof et al. (1991), economists have raised the possibility of employment subsidies to help address EU disparities and reduce the risk of "downward spirals" arising from large localized negative shocks. But the emphasis of EU cohesion policy has remained on infrastructure investment and physical capital subsidies. Perhaps the set of cohesion policy instruments needs to be expanded?

Historically, arguments between proponents of place-based or place-blind policies have been conducted as an either-or debate. In a world where some people are mobile, and others are not, we do not find this distinction helpful.

Instead we need to understand the impacts of a range of different policies regardless of whether they are targeted at people or at places. The cost-effectiveness, the consequences for spatial disparities, and the benefits for different kinds of people living in different places, are likely to vary significantly across policies. It is unlikely that a priori classifications of policy as place-based or place-blind will be very informative about these differential impacts on redistribution and aggregate efficiency, and the tradeoffs between them.

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Online Appendix:

Data Sources

Our main data is from Eurostat and the EU Joint Research Centre's (EUJRC) regional database. We use the 2016 NUTS3 level classification. For data provided according to the 2010 or 2013 NUTS classification we apply the mapping provided by EUJRC to assign the corresponding 2016 NUTS3 regions (https://urban.jrc.ec.europa.eu/nutsconverter/#/). We exclude the French overseas territories, the Canary Islands, the autonomous regions Ceuta and Melilla, and the autonomous regions Azores and Madeira. We restrict the data to the EU15 for the period 1980-2003 and cover the EU28 from 2004 to 2015.

Information about real estate price indices, used to produce Figure 3b, is available for France, Germany, Italy, Spain, and England. We collect this information from several sources. Data for France comes from MeilleursAgents and covers Paris, top10 and top50 cities between 2007 and 2015. The index for Germany is based on the Regional Real Estate Price Indices for Germany (RWI-GEO-REDv1) constructed by Boelmann and Schaffner (2019) and covers real estate advertisement data for individual units between 2007 and 2019 which we assigned to NUTS3 regions. Information for Italy is obtained from the Osservatorio Mobiliare Italiano and contains transaction-level data on residential real estate sales in Italian provinces between 2007 and 2011; For Spain we use the Indice de Mercados Immobiliarios Espanoles provided by TINSA on the city level for 2001 to 2015. The data for English cities (we lack Scotland, Northern Ireland, and Wales) is based on Hilber and Mense (2019) covering Local Planning Authorities between 2000 and 2015.

Information about tertiary education rates, used to produce column 2 of Table 1, is provided by EUJRC at NUTS2 level and we assign each NUTS3 region the education rate of the corresponding upper tier NUTS2 region.

Micro level information on earnings, education and residential information, used to estimate the mincer regressions reported in the text, is provided by the EU Statistics on Income and Living Conditions. We focus in our analysis on the cross-section for 2015 while the results are robust to using different years (in principle the data is available since 2004 with some differences in the coverage of countries).

EU Metro Regions

As discussed in the text, we use the recent EC/OECD specification of metropolitan regions that provide a consistent definition for the whole EU. Details on how these are constructed can be found in OECD (2019). The following text, taken from p.3 of that report, provides a short definition.

A functional urban area can be defined in four steps:

1. Identify an urban centre: a set of contiguous, high density (1,500 residents per square kilometre) grid cells with a population of 50,000 in the contiguous cells;
2. Identify a city: one or more local units that have at least 50 percent of their residents inside an urban centre;
3. Identify a commuting zone: a set of contiguous local units that have at least 15 percent of their employed residents working in the city;
4. A functional urban area is the combination of the city with its commuting zone.

We use the version that defines metropolitan-regions (‘metros’) in terms of NUTS3 or aggregates of NUTS3, as appropriate. Table A1 provides a list of the metro-regions by country, while table A2 provides basic descriptive statistics.

Table A1:
Metros by country

AT	Lübeck	**FI**	Palermo	Ploieşti
Graz	Magdeburg	Helsinki	Parma	Timisoara
Innsbruck	Mainz	Tampere	Prato	**SE**
Linz	Mannheim-Ludwigshafen	Turku	Reggio nell'Emilia	Göteborg
Salzburg	Mönchengladbach	**FR**	Roma	Malmö
Wien	München	Amiens	Taranto	Stockholm
BE	Münster	Angers	Torino	Uppsala
Antwerpen	Neubrandenburg	Annecy	Venezia	**SI**
Bruxelles / Brussel	Nürnberg	Besanþon	Verona	Ljubljana
Charleroi	Offenburg	Bordeaux	**LT**	Maribor
Gent	Oldenburg	Brest	Kaunas	**SK**
Liège	Osnabrück	Caen	Vilnius	Bratislava
BG	Paderborn	Clermont-Ferrand	**LU**	Košice
Burgas	Pforzheim	Dijon	Luxembourg	**UK**
Plovdiv	Regensburg	Grenoble	**LV**	Aberdeen
Sofia	Reutlingen	Le Mans	Riga	Belfast
Varna	Rosenheim	Lille - Dunkerque - Valenciennes	**MT**	Blackburn - Blackpool - Preston
CY	Rostock	Limoges	Valletta	Bournemouth
Lefkosia	Ruhrgebiet	Lyon	**NL**	Bradford
CZ	Saarbrücken	Marseille	Amsterdam	Brighton and Hove
Brno	Schweinfurt	Montpellier	Arnhem - Nijmegen	Bristol
Ostrava	Schwerin	Mulhouse	Breda	Cambridge
Plzen	Siegen	Nancy	Eindhoven	Cardiff
Praha	Stuttgart	Nantes	Enschede	Cheshire West and Chester
DE	Ulm	Nice	Groningen	Colchester
Aachen	Wetzlar	Nimes	Leeuwarden	Coventry
Aschaffenburg	Wiesbaden	Orléans	Leiden	Derby
Augsburg	Wuppertal	Paris	Rotterdam	Doncaster
Bayreuth	Würzburg	Pau	Tilburg	Dundee
Berlin	Zwickau	Perpignan	Utrecht	Edinburgh
Bielefeld	**DK**	Poitiers	Zwolle	Exeter
Bocholt	Aalborg	Reims	s' Gravenhage	Glasgow
Bonn	København	Rennes	**PL**	Ipswich
Braunschweig-Salzgitter-Wolfsburg	Odense	Rouen - Le Havre	Bialystok	Kingston upon Hull
Bremen	Århus	Saint-Etienne	Bielsko-Biala	Kirklees
Bremerhaven	**EE**	Strasbourg	Bydgoszcz - Torún	Leeds
Darmstadt	Tallinn	Toulouse	Czestochowa	Leicester

Dresden	**EL**	Tours	Gdansk	Liverpool
Düren	Athina	**HR**	Katowice	London
Düsseldorf	Thessaloniki	Grad Zagreb	Kielce	Manchester
Erfurt	**ES**	Split	Kraków	Medway
Flensburg	A Coruña	**HU**	Lublin	Middlesbrough
Frankfurt am Main	Alicante/Alacant - Elche/Elx	Budapest	Lódz	Newcastle upon Tyne
Freiburg im Breisgau	Barcelona	Debrecen	Olsztyn	Northampton
Gießen	Bilbao	Miskolc	Opole	Norwich
Görlitz	Cádiz	Pécs	Poznan	Nottingham
Göttingen	Córdoba	Székesfehérvár	Radom	Oxford
Halle an der Saale	Granada	**IE**	Rzeszów	Plymouth
Hamburg	Guipúzcoa	Cork	Szczecin	Portsmouth
Hannover	Madrid	Dublin	Tarnów	Sheffield
Heidelberg	Murcia - Cartagena	**IT**	Warszawa	Southampton
Heilbronn	Málaga - Marbella	Bari	Wroclaw	Stoke-on-Trent
Hildesheim	Oviedo - Gijón	Bergamo	**PT**	Sunderland
Ingolstadt	Palma de Mallorca	Bologna	Coimbra	Swansea
Iserlohn	Pamplona/Iruña	Brescia	Lisboa	West Midlands urban area
Kaiserslautern	Santander	Cagliari	Porto	
Karlsruhe	Sevilla	Catania	**RO**	
Kassel	Valencia	Firenze	Brasov	
Kiel	Valladolid	Genova	Bucuresti	
Koblenz	Vigo	Messina	Cluj-Napoca	
Konstanz	Vitoria/Gasteiz	Milano	Constanta	
Köln	Zaragoza	Napoli	Craiova	
Leipzig		Padova	Galati	
			Iasi	

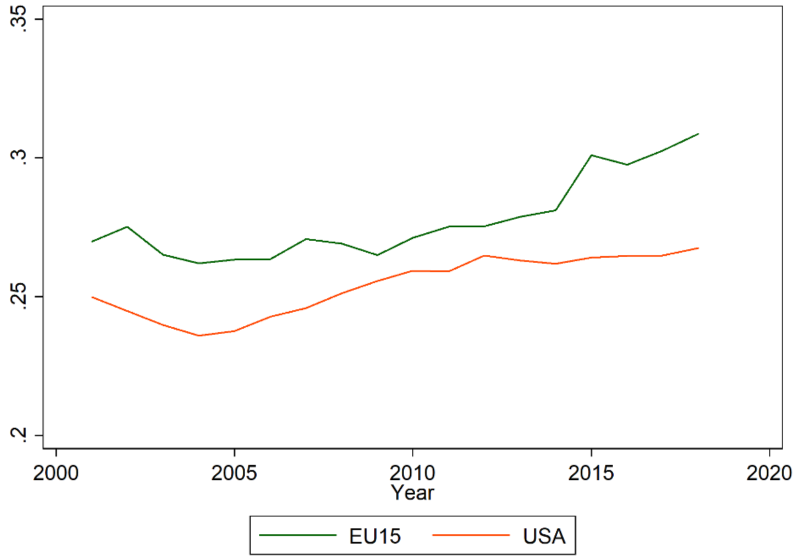
Table A2
Summary statistics EU metros

	Obs.	Mean	Std.dev.	Min	Max
Year 1980					
Population (1000)	215	985	1,252	205	11,206
GDP per capita	215	7,879	2,464	2,476	19,608
Employment (1000)	215	422	607	91	6,016
Year 1990					
Population (1000)	215	1,015	1,282	212	11,254
GDP per capita	215	16,580	4,375	8,384	30,685
Employment (1000)	215	457	654	100	6,417
Year 2000					
Population (1000)	226	1,044	1,328	226	11,932
GDP per capita	226	23,364	5,983	11,538	48,663
Employment (1000)	226	491	690	89	6,616
Tertiary share (%)	212	21.4	6.5	3.3	38.5
Worklessness share (%)	211	30.7	9.7	8.5	58.7
Year 2005					
Population (1000)	279	1,042	1,270	236	12,316
GDP per capita (1000)	279	24,522	8,197	6,254	57,328
Employment (1000)	279	493	657	98	6,692
Tertiary share	271	23.0	7.4	7.8	42.3
Worklessness share	264	31.0	9.5	0.9	57.1
Year 2015					
Population (1000)	279	1,088	1,366	248	13,839
GDP per capita	279	30,182	9,839	11,210	76,152
Employment (1000)	260	522	725	96	7,874
Tertiary share (%)	260	30.3	8.5	11.57	52.4
Worklessness share (%)	260	28.2	11.6	-4.3	57.3

Notes: We summarize the data for 1980-2000 for EU15 metros and 2000-15 for EU28 metros. Until 1990 we lack data for 11 East-German metros. The share of tertiary education is imputed using NUTS2 level data and is available only since 2000. Worklessness is computed using employment data and population counts for the age group 15-64 which is available since 2000. We lack data on employment for metros in Lithuania and Poland. A negative value of workessness share applied in Luxembourg where cross border commuting is common.

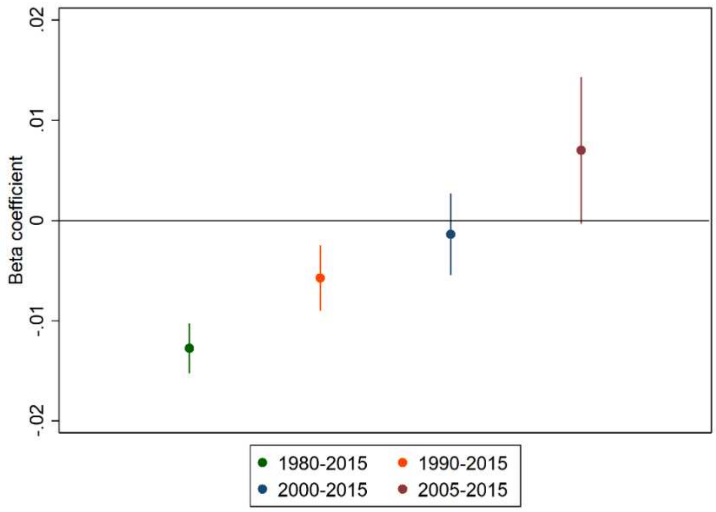
Spatial Disparities in Europe: Additional Figures

Figure A1
Coefficient of Variation of GDP per capita – Metropolitan areas EU15, and US



Source: Authors
Notes: Calculations based on OECD data and the definition of OECD metro areas.

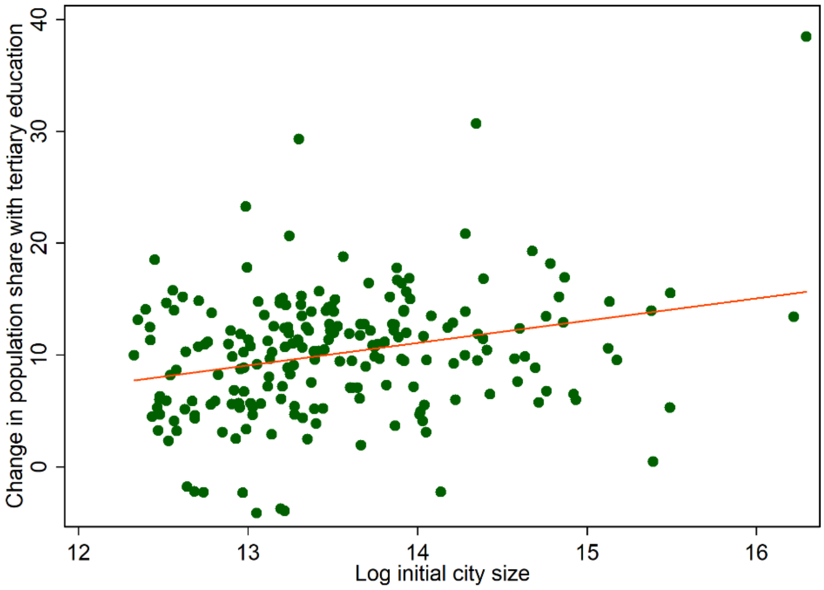
Figure A2: Beta Convergence– EU15 Metro Regions



Notes: Authors' own calculations. We report the coefficients and 95% confidence intervals for standard beta convergence regressions. For the EU28, we can only compute the beta coefficient for 2005 to 2015. Consistent with the CV, we observe significant beta convergence (coefficient 0.031, significant at the 1 percent level) as the metros of the new EU member states catch up to the EU15.

Figure A3

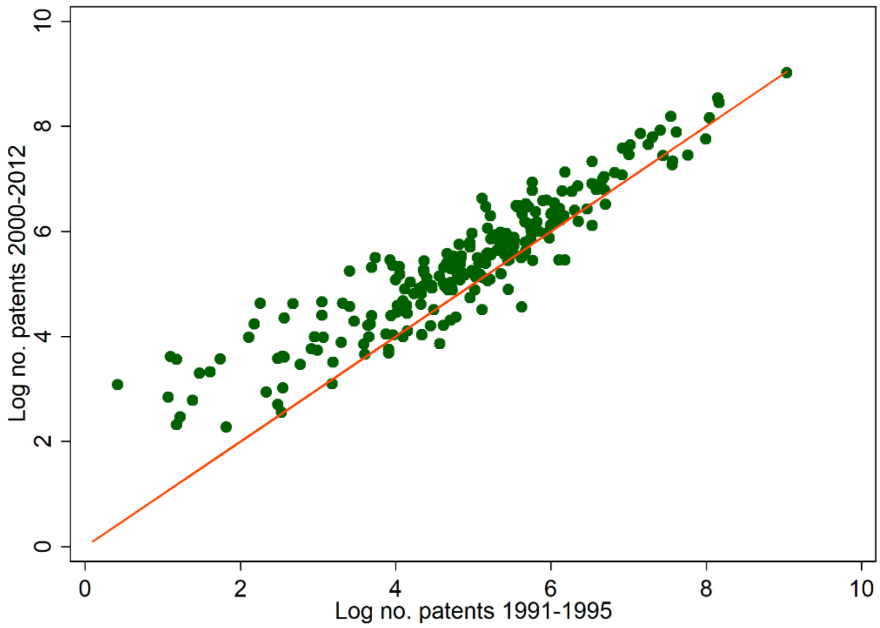
Change in the share of population with tertiary education 2015-2000 – EU15 Metros



Notes: The coefficient for the linear regression illustrated by the straight line is 1.99 (significant at the 1 percent level). With country fixed effects the coefficient is 1.36. If we use the log of initial population with tertiary education instead of log of population the coefficient is 1.62 (with country fixed effects).

Figure A4

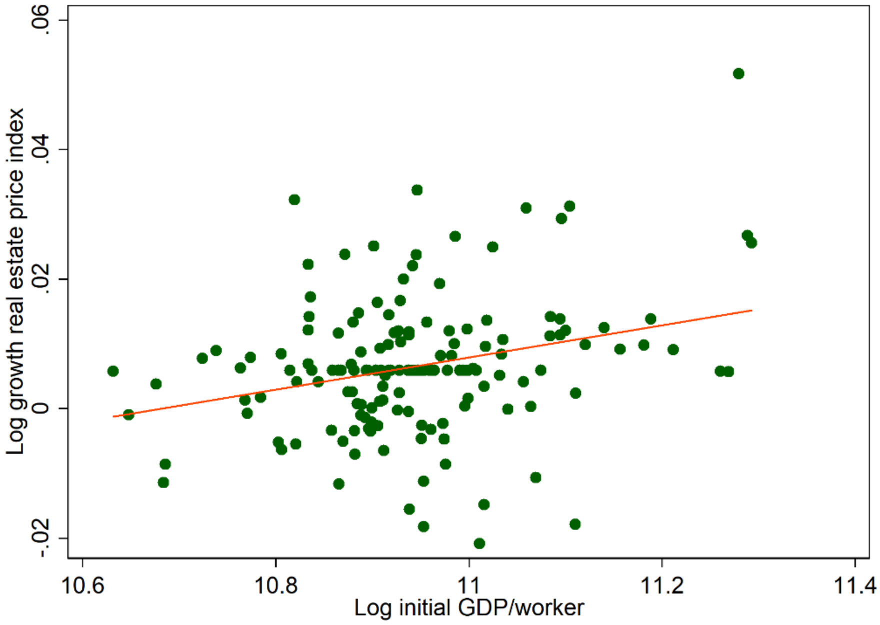
Change in the number of patents 2010(12)-1985(81) – EU15 Metros



Notes: The straight line represents the 45-degree line.

Figure A5

Change in real estate price index and initial productivity – EU15 Metro areas



Notes: The coefficient for the linear regression illustrated by the straight line is 0.025 (significant at the 1 percent level). The scatter plot and the regression are conditional on country fixed effects. We use the period 2005-2015. For Italy we only have data until 2011.

Evidence on Agglomeration Economies

Table A3: **Micro level evidence on agglomeration economies – EU15 in 2015**

VARIABLES	(1) Log income	(2) Log income	(3) Log income
Log age	4.633***	3.724***	3.726***
	(0.0703)	(0.0677)	(0.0677)
Log age ^2	-0.611***	-0.473***	-0.473***
	(0.0108)	(0.0104)	(0.0104)
Female	-0.188***	-0.230***	-0.230***
	(0.00442)	(0.00424)	(0.00424)
City	0.115***	0.0646***	0.0529***
	(0.00489)	(0.00469)	(0.00617)
Tertiary Education		0.397***	0.388***
		(0.00436)	(0.00531)
Tertiary Education x City			0.0260***
			(0.00887)
Constant	1.677***	3.014***	3.013***
	(0.114)	(0.109)	(0.109)
Observations	81,349	81,349	81,349
R-squared	0.395	0.451	0.451

Notes: City is unity if the individual lives in a high-density area according to Eurostat's Degree of urbanisation (DEGURBA) classification. Tertiary is unity if the individual has completed the first stage of tertiary education (not leading directly to an advanced research qualification) or the second stage of tertiary education (leading to an advanced research qualification). We drop self-employed and family workers. Standard errors in parentheses; all specifications include country fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table A4: **Micro level evidence on sorting by education – EU15 in 2015**

VARIABLES	(1) City	(2) City	(3) City
	Linear models		Logit
Tertiary Education	0.0942***	0.107***	0.0913***
	(0.00200)	(0.00192)	(0.00195)
Log age	-0.0292*	-0.00830	-0.0274*
	(0.0154)	(0.0146)	(0.0154)
Log age ^2	-0.000394	-0.00328	-0.000701
	(0.00236)	(0.00223)	(0.00236)
Constant	0.387***	0.347***	
	(0.0244)	(0.0231)	
Observations	275,585	275,585	275,585
R-squared	0.010	0.116	
Country fixed effects	No	Yes	No

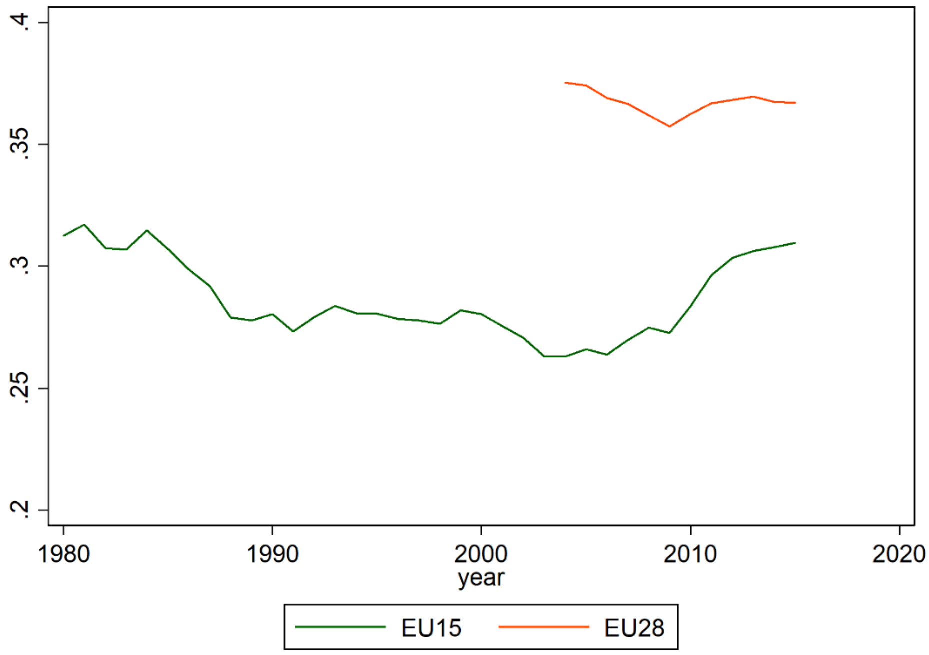
Notes: City is unity if the individual lives in a high-density area according to Eurostat's Degree of urbanisation (DEGURBA) classification. Tertiary indication is unity if the individual has completed the first stage of tertiary education (not leading directly to an advanced research qualification) or the second stage of tertiary education (leading to an advanced research qualification). Column 3 reports the marginal effects evaluated at the mean of each variable. Standard errors in parentheses; all specifications include country fixed effects. *** p<0.01, ** p<0.05, * p<0.1

EU NUTS2 Regions

Although we have reservations about the use of NUTS2 regions, as discussed in the main text, convergence across NUTS2 regions is an important EU policy aim. One important headline indicator of disparities, because it determines eligibility for the most important EU regional funds, is whether a NUTS2 region has GDP per capita less than 75 percent of the EU average. In the EU15 in 2015, 46 NUTS2 regions out of 204, home to 19 percent of the population, were 75 percent of the average GDP per capita. In the EU28, the corresponding figures were 72 out of 262 and 26 percent of the population. For comparison, 6 US states, home to 6 percent of the population, have GDP per capita less than 75 percent of the US average.

In 2015, the coefficient of variation (CV) in GDP per capita was 0.31 for EU15 NUTS2 regions and 0.37 for EU28 NUTS2 regions.[8] As for metros, variation across EU15 and EU28 countries explains around half of this variation (43 percent and 51 percent, respectively).[9] For the EU 15, regional disparities fell in the 1980s, stabilised in the 1990s before falling again from around 2000 to the mid-2000s (see figure A6).[10] Overall, the coefficient of variation fell from 0.31 in 1980 to 0.26 in 2003. The double-dip recession of 2009 and 2012 reversed this long-term trend and by 2015 regional disparities were almost back to their 1980 levels. For the EU28 we have a much shorter time series. Starting in 2004, when the new members joined the EU, the coefficient of variation fell from 0.38 to a low of 0.36 in 2009 and then remained at similar levels until 2015.

Figure A6
Variance coefficient of GDP per capita – NUT2 regions



Notes: Authors own calculations based on NUTS2 regions as described in the text.

[8] As discussed in the main text, in 2015, aggregating the five London NUTS2 reduces the EU15 coefficient of variation by 29 percent from 0.44 to 0.31. For the population weighted version of the coefficient of variation the reduction is 18 percent. We therefore aggregate the London NUTS2.
[9] These figures are based on decomposing the squared coefficient of variation.
[10] The figures report the unweighted coefficients of variation. The overall levels and trends for the EU15 and EU28 are largely unchanged if we weight by population.