Migration and regional development in the EU

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Abstract

This paper tackles the question whether and why labour mobility fosters or hampers regional disparities. In so doing, it presents the findings of two studies on Finland and a large set of European countries. The study on Finland suggests that internal labour mobility fosters regional disparities, especially in economies increasingly specialized in sectors characterized by intense scale economies (internal or external to the firm), strong market power, tight input-output relations, higher relative intensity of mobile than immobile factors (such as capital and skilled labour versus land and unskilled labour), rapidly changing products and tasks (as in hi-tech industries), high value added (that is, small congestion cost per euro produced). In addition, the cross-country study on Europe shows that international labour mobility may fuel further regional divergence as migrants bring some attributes with them that complement the attributes of the native workforce. From a policy point of view, this evidence implies that labour mobility can be a powerful driver of productivity growth but unfortunately not of regional convergence.

1 This paper has been prepared as background for presentation at the BEPA Workshop “The geography of regional development in Europe: What cohesion policies can and cannot do?”, Brussels 29 January 2009, organised in the context of the EU budget review.
.1 Introduction

In the European debate on cohesion the geographical mobility of workers often looks like everybody’s felon. To some observers too little labour mobility prevents an efficient allocation of resources across economic activities, thus causing persistent income differentials between more and less developed regions. To others, through brain drain, too much labour mobility locks backward regions in a vicious spiral of underdevelopment. In both case, it is argued that ‘conventional’ measures of EU regional policy centred on investment or subsidies can not bear fruits and merely have redistributive effects.

Against this background, this paper tackles the specific question whether and why labour mobility fosters or hampers regional disparities. The discussion is structured in three additional sections plus some concluding remarks. Section .2, mostly based on Ottaviano and Pinelli (2005), provides a brief survey of the main arguments linking labour mobility and regional development in the presence of localized externalities. Then, following Ottaviano and Peri (2005, 2006), it translates the foregoing arguments into an analytical framework that can be used to structure empirical investigation. Section .3 adopts the analytical framework to discuss the empirical relevance of those arguments presenting the findings of Ottaviano and Pinelli (2006) in the case of Finnish regions. Section .4 reports additional findings from Bellini, Ottaviano, Pinelli and Prarolo (2008) on a specific source of localized externalities stemming from complementarities between immigrants and natives. The reader should refer to those papers for additional details and extensive lists of related references.

The general conclusion is that labour mobility indeed fuels regional disparities by increasing productivity in the destination regions of migrants and decreasing it in their regions of origin. This happens also because of complementarities between the characteristics of immigrants and natives.

.2 Sources of regional disparities

This section discusses when and how migration can be expected to affect regional development. In so doing, it highlights the microeconomic conditions that support the emerge of regional disparities.

.2.1 First vs. second nature

Places have different relative abundance of natural resources, proximity to natural means of communication, and climatic conditions. However, these features (a.k.a. ‘first nature’) provide only a partial explanation of the pronounced differences in development existing even between areas that
are fairly similar in terms of such exogenous characteristics. For this reason it has been argued that regional unbalances have to be driven also by other additional forces (a.k.a. ‘second nature’) that are inherent to the functioning of economic interactions and are able to cause uneven development even across ex-ante identical places.

Along the years a rich list of ‘second nature’ forces have been proposed by geographers, regional scientists and urban economists. A first approach stresses the role of ‘technological externalities’. These are independent from any market interaction as they materialize through sheer physical proximity. A second approach focuses, instead, on market rather than non-market interactions. Its cornerstone is the location decision of the firm. This entails solving a non-trivial economic problem as long as the shipment of goods and factors across space as well as the fragmentation of production are both costly, due to trade obstacles and plant-level scale economies respectively. Increasing returns to scale at the plant level and costly transportation generate an economic trade-off between the ‘proximity’ to dispersed customers and suppliers on the one hand, and the ‘concentration’ of production in few large plants on the other. A firm has an incentive to fragment production across many small plants when returns to scale are weak and transport costs are large. It prefers to concentrate production in few large plants when returns to scale are strong and transport costs are small. The location decision is made more complex by the presence of competitors because the geographical positioning of the firm with respect to them affects the market power that necessarily stems from plant-level economies of scale. Accordingly, careful positioning can boost a firm’s market power.

In terms of social welfare, according to the second approach, the presence of market power implies that the prices, on which consumers and firms base their consumption, production and location decisions, do not fully reflect the corresponding social values. Thus, market interactions generate ‘side effects’ for which no quid-pro-quo is paid. Such side effects that are associated with market transactions are called ‘pecuniary externalities’ and imply that the location decision of the firm does not take into full account its effects on customers, suppliers and competitors. As to the first approach, technological externalities are the outcome of non-market interactions and thus, also for them, no quid-pro-quo is paid by definition. An example of positive pecuniary externality for a localized downstream industry is the fall in intermediate input prices due to the increase in upstream competition triggered by the entry of a new technologically advanced supplier; an example of positive technological externality is the increase in productivity that other upstream suppliers may experience through informal knowledge transmission (‘spillover’) generated by their proximity to their new technologically advanced rival. While both concepts have their own merits, the logical advantage of pecuniary externalities lies in the possibility of relating their emergence to a set of
well-defined microeconomic parameters, which has proven to be quite difficult in models based on technological externalities as these still remain mostly ‘black boxes’.

To summarize, no matter whether through market or non-market interactions, the attractiveness to a firm of alternative production sites depends on where other firms locate. This may activate a mechanism of ‘cumulative causation’ among firms’ location decisions through which firms’ interactions (‘second nature’) may alter the economic landscape implied by natural resources, natural means of communication, and climatic conditions (‘first nature’). However, as ‘second nature’ is driven by externalities, the free-market economic landscape is inherently inefficient and appropriate public intervention is generally needed.

2.2 The role of migration

To understand how cumulative causation may work, let us expand on the previous example of upstream and downstream industries. For simplicity, consider a stylized economy made of two initially identical locations, A and B. Both host identical production chains in which there are three vertically linked activities: intermediate production, final production, and consumption. For simplicity, assume that final production uses only intermediate inputs, intermediate production employs only labour, workers are the only source of final demand and they are geographically immobile. If, for any reason, a new firm starts producing intermediates in A, it will increase local labour demand and intermediate supply. Due to excess demand and supply respectively, local wages will go up while local intermediate prices will fall. This is bad news for the other local intermediate producers (‘market crowding effect’ due to competitor proximity). However, it is good news for local final suppliers, who experience falling production costs and higher demand by richer workers. As new final producers are lured to enter the market in A, the expansion of final production will feed back into stronger intermediate demand so that also intermediate suppliers will benefit (‘market expansion effect’ due to customer proximity). Clearly, when the latter effect dominates the former, both final and intermediate firms will end up being agglomerated in A. Accordingly, cumulative causation among firms’ location decisions can generate persistent differences even among initially identical places (‘second nature’).

Cumulative causation is more likely to materialize in the presence of labour migration and capital accumulation (as long as financial markets are imperfectly integrated). The reason is that both tend to reinforce the market expansion effect discussed above through the additional income they generate. We have seen that intermediate entry expands labour demand and final production, which itself feeds back into stronger demand and hence increased production of intermediates. The associated rise in wages in location A attracts workers from B. As these migrate, demand in the
final market increases generating an additional cycle of cumulative causation between firms’ and workers’ location decisions. At the same time, the expansion of intermediate and final markets increases industry profits thus fostering investment in capital accumulation and innovation.

Figure 1 depicts the self-sustaining cycle of income and expenditures growth that may eventually arise from cumulative causation in location A. As a parallel symmetric cycle of income and expenditures contraction arises in location B, small transitory location-specific shocks can give rise to large permanent regional disparities.

Cumulative causation could lead to full agglomeration if clustering did not affect the prices of non-traded goods and factors, such as land or, to some extent, unskilled labour. However, as firms cluster the markets of non-tradables may be put under pressure on the demand side and their prices may therefore rise. If this price increase is strong enough, agglomeration may then unfold.

To summarize, second-nature agglomeration should be more pronounced and more persistent in sectors characterized by intense scale economies (internal or external to the firm), strong market power, tight input-output relations, higher relative intensity of mobile than immobile factors (such as capital and skilled labour versus land and unskilled labour), rapidly changing products and tasks (as in hi-tech industries), high value added (that is, small congestion cost per euro produced).
.2.3 A framework for empirical investigation

Empirical investigation can be structured using an analytical framework of firm location and labour migration in which localised external effects affect both firm productivity and household satisfaction.

The framework considers $N$ regions, indexed by $c=1,\ldots,N$. There are two factors of production, labour (perfectly mobile) and land (fixed). The total amount of land is exogenously allocated to regions and $H_c$ denotes the amount of land in region $c$. To ensure that the rental income of workers, if any, is independent of residence and therefore does not affect migration choices, land is assumed to be owned by locally resident landlords. Total labour supply is $L$ and each worker inelastically supplies one unit of labour. $L_c$ denotes the number of workers living and working in region $c$. Intraregional commuting costs are zero and interregional commuting costs are prohibitive, so we can focus on the interregional allocation of workers.

Preferences are defined over the consumption of land $H$ and a homogenous good $Y$ that is freely traded among regions. The utility of a typical worker $i$ in region $c$ is given by:

$$U_{ic} = A_U(d_c)H_{ic}^{1-\mu}Y_{ic}^\mu$$

where $0<\mu<1$. In this expression, $H_{ic}$ and $Y_{ic}$ are land and good consumption, while $A_U(d_c)$ captures the consumption externality associated with some local characteristic $d_c$ of region $c$. If the first derivative $A_U'(d_c)$ is positive, then the characteristic has a positive effect on workers utility (i.e., an amenity effect). If the first derivative $A_U'(d_c)$ is negative, then the characteristic has a negative effect on workers utility (i.e., a disamenity effect). Workers move to the region that offers them the highest utility. Utility maximisation then implies the following level of satisfaction (‘indirect utility’):

$$(1) \quad V_{ic} = (1-\mu)^{1-\mu}\mu^{\mu}A_U(d_c)\frac{E_c}{r_c^{1-\mu}p_c^\mu}$$

where $r_c$ is the land rent, $w_c$ is the wage, $p_c$ is the price of the final good and $E_{ic}$ is worker $i$’s expenditure. Given the assumption on land ownership, $E_{ic}$ consists of wage only: $E_{ic}=w_c$.

As to production, good $Y$ is supplied by perfectly competitive firms using both land and labour as inputs. The typical firm $j$ in a region $c$ produces according to the following technology:

$$(2) \quad Y_{jc} = A_Y(d_c)H_{jc}^{1-\alpha}L_{jc}^\alpha$$

where $0<\alpha<1$. In (2), $H_{jc}$ and $L_{jc}$ are land and labour inputs, while $A_Y(d_c)$ captures the productivity externality associated with the local characteristic $d_c$. If the first derivative $A_Y'(d_c)$ is positive, then
the characteristic has a positive effect on firms’ productivity (i.e., a positive productivity effect). If the first derivative $A_Y'(d_c)$ is negative, then the characteristic has a negative effect on firms productivity (i.e., a negative productivity effect). Given (2) and profit maximisation, it is possible to solve for the marginal cost pricing condition:

$$p_c = \frac{r_c^{1-\alpha} w_c^\alpha}{(1-\alpha)^{1-\alpha} \alpha^\alpha A_Y(d_c)}$$

As $Y$ is freely traded, its price will be the same everywhere and we can set it to one without loss of generality, i.e. $p_c=1$.

In equilibrium workers must be indifferent between locations, i.e. their indirect utility is equalised across regions:

$$V_k = V_c, \forall k, c = 0...N$$

In what follows, we will refer to (4) as the ‘free migration condition’. Similarly, in equilibrium no firm has an incentive to exit or enter the market. This is ensured by the marginal cost pricing condition that, given $p_c=1$, can be re-written as:

$$r_c^{1-\alpha} w_c^\alpha = (1-\alpha)^{1-\alpha} \alpha^\alpha A_Y(d_c)$$

In what follows, we will refer to (5) as the ‘free entry condition’. In order to use the model for empirical investigation, it is necessary to solve for the rent and wage levels at the equilibrium allocation. This requires solving together the free migration condition (4) and the free entry condition (5) while taking account of (1). The result is the ‘wage equation’:

$$\ln w_c = \frac{(1-\mu)\eta_Y -(1-\alpha)\eta_Y}{1-\alpha\mu} + \frac{1}{1-\alpha\mu} \ln \left( \frac{A_y(d_c)^{1-\mu}}{A_Y(d_c)^{1-\alpha}} \right)$$

and the ‘rent equation’:

$$\ln r_c = \frac{\eta_Y + \alpha\eta_Y}{1-\alpha} + \frac{1}{1-\alpha\mu} \ln (A_y(d_c)[A_Y(d_c)]^\mu)$$

where $\eta_Y = (1-\alpha)^{1-\alpha} \alpha^\alpha$, $\eta_Y = (1-\mu)^{1-\mu} \mu^\mu / \nu$ and $\nu$ is the level of satisfaction that, with free migration, in equilibrium is the same across all region.

Equations (6) and (7) give the relation between the local characteristic $d_c$ and factors prices and represent the theoretical foundation of empirical investigation. They must be estimated together as the estimation of only one of them would run into an identification problem. To see this, consider estimating equation (7). A positive correlation between $d_c$ and wages would be consistent with both
a disamenity effect \((AU'(d_c)<0)\) and a positive productivity effect \((AY'(d_c)>0)\). Analogously, a positive correlation between \(d_c\) and rents would be consistent with both an amenity effect \((AU'(d_c)>0)\) and a positive productivity effect \((AY'(d_c)>0)\). Only the joint estimation of (6) and (7) will allow the identification of the dominant effect. Specifically:

\[
\frac{\partial r}{\partial d_c} > 0 \quad \text{and} \quad \frac{\partial w}{\partial d_c} > 0 \quad \text{when dominant positive productivity effect} \quad A_Y'(d_c)>0
\]

\[
\frac{\partial r}{\partial d_c} > 0 \quad \text{and} \quad \frac{\partial w}{\partial d_c} < 0 \quad \text{when dominant consumption amenity} \quad A_U'(d_c)>0
\]

\[
\frac{\partial r}{\partial d_c} < 0 \quad \text{and} \quad \frac{\partial w}{\partial d_c} < 0 \quad \text{when dominant negative productivity effect} \quad A_Y'(d_c)<0
\]

\[
\frac{\partial r}{\partial d_c} < 0 \quad \text{and} \quad \frac{\partial w}{\partial d_c} > 0 \quad \text{when dominant consumption disamenity} \quad A_Y'(d_c)<0
\]

Figure 2 provides a graphical representation of the spatial equilibrium and the associated identification problem. Regional nominal wages \((w)\) are measured along the vertical axis and regional land rents \((r)\) along the horizontal one. Downward sloping lines depict the ‘free entry condition’, i.e. the combination of rents and wages that make firms indifferent across locations. Their downward slope reflects the fact that firms can earn the same profit in different regions provided that higher wages correspond to lower rents and vice-versa. Upward sloping lines depict the ‘free migration condition’, i.e. the combination of rents and wages that make workers indifferent across locations. Their upward slope reflects the fact that workers can achieve the same utility (‘real wage’) in different regions provided that higher rents correspond to higher wages and vice-versa. The intersection between the two curves gives the wage and rent equilibrium.
Local characteristic $d_c$ acts as a shift parameter on the two curves. A positive shock to $d_c$ shifts the ‘free entry condition’ upward (downward) if the characteristic has a positive (negative) productivity effect. It shifts the ‘free migration condition’ downward (upward) if the characteristic has a consumption amenity (disamenity) effect. We can therefore identify the dominant effect of the characteristic by looking at the impacts of shocks on the equilibrium factor prices.

Suppose A represents the initial equilibrium at factor prices $(r,w)$. Suppose also that there is a shock to $d_c$ and we observe higher wages $(w' > w)$ after the shock. Figure 2 shows that in principle this could be associate either with an upward shift of the free entry condition (point B), indicating a positive productivity effect, or with an upward shift of the free migration condition (point C), indicating a negative effect on workers quality of life (or consumption disamenity). To distinguish whether higher wages signal higher productivity or worse quality of life, additional information is needed. In Figure 2 that is provided by rents: whereas higher productivity is associated with higher wages and higher land rents (point B), worse quality of life is associated with higher wages but lower land rents (point C). By symmetry the foregoing arguments can be applied to downward shifts of the firm and worker indifference lines. A reduction in productivity shifts the firm line downward, which reduces both wages and land rents (point D). An improvement in the quality of life shifts the worker line downward, thus decreasing wages and increasing land rents (point E).

Before moving to empirics, it is important to stress the implications of labour mobility on Figure 2. Consider the extreme case of no labour mobility. In such case, the ‘free migration condition’ becomes vertical and wage differentials measure productivity differentials. When this is the case,
we could simply estimate the wage equation and identify wage responses to local characteristics as productivity effects. However, whenever labour mobility is not absent, one has to estimate also the rent equation in order to rule out that higher wages reflect disamenity effects. Alternatively, one could use direct information about migration flows. Since land values capitalize the attractiveness of a place, land rents rise also because immigration increases the demand for land.

.3 Does labour mobility foster regional disparities?
Ottaviano and Pinelli (2006) tackle this question in the case of Finland from 1977 to 2002. Finnish regions provide an attractive scenario for testing the above predictions for the following reasons. First, as the units of analysis belong to the same country, differences in regional development are unlikely to be driven by institutional differences or Ricardian comparative advantage, which have both been shown to play an important role in cross-country studies. Second, between 1990 and 1993, Finland was hit by a dramatic exogenous shock, the ‘recession’, which is considered a ‘watershed’ under several respects (more on this below). Such shock is exogenous to any region-specific development. Third, Finland entered the recession as an economy characterized by traditional industries, low skills, and limited labour mobility. It emerged as an economy increasingly characterized by skill-intensive sectors, high skills and mobile workers. Between 1995 and 2000, about 1.5 million people changed municipality whereas only 1.2 million did the same over 1985-1990, which amounts to a 25% increase in migration flows across Finnish municipalities. This allows us to test the role of local characteristics (including local externalities) in two rather different economies within quite a homogenous data set.

Interestingly, the regional dimensions of the recession and the following boom were rather different. The recession treated all regions quite equally. Despite differences in timing (the recession first affected export industries and the industrial regions of the south, then spread to the rest of the country), output and the number of people in work fell by, respectively, 5-10 per cent and about 20 per cent everywhere. The boom had instead a strong regional dimension. The concentration of fast growing high-tech industries (and related business services) favoured areas such as Salo, Oulu and Helsinki, while rural and traditional areas suffered from the poor output and (to a much larger extent) employment performance of primary and traditional manufacturing industries.

The regional dimension of the boom was reinforced by several changes affecting the policy environment. Firstly, efforts to balance the public economy, privatize operations and produce public services more efficiently led to a decrease of over 100,000 jobs over 1990-1995 (mostly
concentrated in administrative centres and service centres in northern Finland). Secondly, while
general government policy is still balancing out regional disparities (richer regions still contribute
more than proportionally to and receive less than proportionally from government accounts), the
scope and structure of direct regional government intervention was re-shaped with the accession to
the European Union, with Structural Funds largely replacing national instruments as the adoption of
the euro imposed stricter constraints of national budgets. Thirdly, accession to the Common
Agricultural Policy further limited the scope for direct intervention to maintain agricultural
production in rural areas. All this was associated with an abrupt stop of the process of regional
convergence observed before the recession.

For all these reasons, the time spanned by the analysis is partitioned in two periods, 1977-1990 (pre-
recession period) and 1994-2002 (post-recession period). Following the consensus approach for
Finnish studies, the three years from 1991 to 1993 are removed as all regions were in recession. The
analysis is carried out at the level of NUTS 4 of the European Union. This classification
corresponds to sub-regional units whose borders follow closely those of commuting districts.

3.1 Explaining regional performance

The discussion in Section 2 suggests to identify the combined effects of local characteristics
(including pecuniary and technological externalities) on productivity and amenity through their
impacts on the levels of wages, rents and migration flows using panel techniques. Under the
assumption that regions have been fluctuating around a balanced growth path (BGP) during the
observed period, the panel estimation of those impacts can be interpreted as their long-run effects
along the BGP. This interpretation allows us to use growth regressions instead of panel regressions
with a double advantage. First, endogeneity would potentially affect the panel estimates since
higher productivity and amenity could be the causes rather than the effects of local externalities. For
example, if booming regions attracted firms and workers, then the positive correlation between
local externalities and immigration could arise due to reverse causation from the latter to the former.
Second, the focus on levels would obscure the dynamic evolution of productivity patterns across
regions, which is an interesting issue in itself given the possibility of cumulative agglomeration. In
this respect, growth allows us to use a variety of existing works on Finland as benchmarks for our
results.

Both issues can be dealt with by estimating standard growth regressions over a set of explanatory
variables including some proxies for local externalities. For instance, as to wages, we will estimate
the following equation:
where the growth rate of regional wages on the left hand side is regressed on its initial value and other ‘initial conditions’ including some proxy of local externalities (details are provided in Section 3.3).

The idea is that along a BGP productivity grows at a constant rate across regions so that these may differ only in terms of wage levels. Then, under the assumption that the economy fluctuates around its BGP, the growth equation captures transitional growth: if a certain region exhibits a higher growth rate than another, then the former has a higher level of wage in BGP than the latter and converges to that level given its initial conditions. As anticipated, while modelling the dynamics of the economy, the above equation also allows us to partially tackle the endogeneity problem. The reason is that, whereas local externalities are measured at the beginning of period (at time $t-1$), the growth of wage is measured during the period of observation (from times $t-1$ to $t$). In other words, the independent variables are predetermined relative to the dependent one.

As argued in Section 2, to disentangle productivity from amenity effects, the above equation has to be matched by similar regressions for land values and migration flows.

### 3.2 Performance measures

To implement our identification strategy, we jointly use the following three measures of regional economic performance:

- **Income per capita growth.** Since wages are not available at the level of NUTS 4, two alternative measures are used to proxy them in terms of income per capita. First, we use taxable income, which refers to gross income accruing from personal, corporate, and property sources less deductions. We use this measure instead of the more commonly used gross regional product (GRP). The reason is that the time series available for taxable income is longer. The key difference between the two measures is that gross regional product refers to production, whereas taxed income refers to earnings accruing from production. The main shortcoming in using taxable income is that it includes income from stock options. The regional distribution of this type of income is very random and might influence substantially overall income in small regions (at least for what concerns the period after the recession). We use, therefore, primary income as an alternative measure to control for this effect. Primary income is available only since 1995 and the corresponding regressions are only estimated for the second period. Both measures of income are deflated by the national price index, which does not affect the nominal cross-region variation predicted by the analytical framework.
• **Population growth.** We use two measures of population growth. The first measure is simply the annual average growth rate of the number of inhabitants in a region. This measure is determined by both birth/mortality rates and net migration flows. However, only the latter are likely to respond to economic factors in short periods of time. We therefore calculate also an adjusted measure of population growth based on net migration flows (i.e., net of newborns and deaths).

• **House price growth.** Rents are generally available only for a small subset of urban areas and very limited time periods. We proxy them by average house prices for which data availability is slightly better. Nonetheless, house prices are not collected for NUTS 4 regions but only at NUTS 3 level, and for the main NUTS 4 subunits in each NUTS 3 unit. Therefore, each NUTS 4 subunit within the same NUTS 3 region is assigned the same value, calculated so that the population weighted average of house prices in the NUTS 4 gives the reported NUTS 3 value. Moreover, house prices are only available from 1987.

### 3.3 Explanatory variables

The macroeconomic literature explains differences in economic growth across geographical areas in terms of two main sets of variables: proximate sources of growth and wider influences. We enlarge the list of the latter to take into account a richer array of geographical variables. In particular, we introduce ‘first nature’ and ‘second nature’ explanatory variables. The former variables capture the exogenous attractiveness of a region due to its abundance of natural resources, its proximity to natural means of communication, and its climatic conditions. The latter capture the endogenous attractiveness of a region determined by economic interactions.

#### 3.3.1 Proximate sources of growth

Proximate sources are production factors that directly affect regional performance:

• **Human capital.** We measure the stock of human capital in two ways: by the share of population with at least a secondary education degree; and by the share of population with at least a tertiary education degree. Following recent literature, we introduce (alternatively) the level of human capital (to capture the so-called ‘technology adoption effect’) and its change over the period (to capture the so-called ‘neo-classical accumulation effect’).

• **Knowledge capital.** We measure the stock of knowledge capital by R&D expenditure per capita and by the number of patents per capita.

• **Physical capital.** The initial level of income is introduced to control for decreasing returns to capital accumulation.
3.3.2 Wider influences

Wider influences affect regional performance indirectly by improving knowledge and technology transfer as well as the efficiency of input allocation.

Policies

We capture the impact of local policy along two dimensions:

- **Labour market.** The unemployment rate is used to proxy the efficiency of the local labour market.

- **Regional policy.** The level of central government expenditure and the level of central government grants to municipalities (both in per capita terms) are used as proxies of interregional redistribution.

- **International openness.** Distance from the Russian border (specifically, from the closest point with passport control) is used to control for proximity to Western Europe and collapsing trade with the former USSR.

- **Infrastructures.** The availability of physical infrastructures is captured by the distance from airports and train stations for the fastest trains. In particular, short distance from airports signals a ‘hub’ function of the region with respect to long-distance economic interactions.

First nature

Geographers stress the role of natural means of communication and climate in determining the economic performances of different areas:

- **Natural communications.** The proximity to natural means of communication is captured by the distance from ports.

- **Climate.** We measure the climatic conditions by the share of land covered by lakes and by the average temperature.

Second nature

Geographical economics stresses two types of localized externalities, ‘pecuniary’ and ‘technological’, that endogenously determine the economic attractiveness of a region. We capture the two types of externalities respectively by:

- **Market potential.** Market interactions are more frequent in regions with a better access to national markets. We use a joint measure of market and supplier access, the so-called ‘nominal
market potential’. For region $i$ this is defined as

$$MP_i = \sum_{j=1}^{n} \frac{\text{Size}_j}{d_{ij}}$$

where $d_{ij}$ is the distance between region $i$ and region $j$. Distances between NUTS 4 regions are calculated as follows. First, distances along main roads are measured between centres of NUTS 5 regions. Second, distances between NUTS 4 regions are computed as population-weighted average distances between NUTS 5 centres within NUTS 4 regions. Third, own distances $d_{ii}$ are weighted average distances between NUTS 5 centres within each NUTS 4 region. Finally, $\text{Size}$ is measured by aggregate income.

- **Population density.** Non-market interactions are more frequent in densely populated areas. Therefore, population density is used to capture the role of technological externalities. Local density may seem too a restrictive measure as ICT promote informal contacts even between remote locations. However, existing empirical evidence suggests that the impact of those contacts appears to fade away quite rapidly with distance.

### 3.4 Results

The results of the estimation of the growth regressions are reported in Table 1 and Table 2 for 1977-1990 and 1994-2002 respectively. Here we present results from the OLS estimation only (see Ottaviano and Pinelli, 2006, for robustness to alternative estimations). As heteroskedasticity often characterises cross-regional analyses, both tables report t-statistics based on robust standard errors. For each dependent variable we present a benchmark regression selected on the basis of explanatory power and robustness. The results of alternative specifications are discussed when relevant to the assessment and the interpretation of results.

#### 3.4.1 Before the recession

Table 1 shows the results of the growth regressions for the first period. Since data on house prices are only available from 1987, we also show the results for population and income growth regressions estimated over the sub-period 1987-1990.
### Table 1 - Before the recession: 1977-1990 (‘low labour mobility’)

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<td>(4.48)</td>
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<td>1.288 ***</td>
<td>0.422 ***</td>
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<td>(3.70)</td>
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<td></td>
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<td>(3.76)</td>
<td>(4.84)</td>
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<td>-9.75 **</td>
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<td>(-1.19)</td>
<td>(1.90)</td>
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<td>79</td>
<td>79</td>
<td>79</td>
<td>76</td>
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<td>R²</td>
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<td>72%</td>
<td>69%</td>
<td>72%</td>
<td>83%</td>
<td>41%</td>
<td>51%</td>
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**Note(s):**
- All explanatory variables are in log terms (apart from shares)
- t-statistics are in parentheses (based on robust standard errors)
- *** = significant at 1% level
- ** = significant at 5% level
- * = significant at 10% level
- + = Population growth due only to net migration flows (net of natural balance)
- $ = Excluding outliers. Regions 56, 61, 79
**Population**

In Table 1 Columns 1, 2 and 3 show the results of the population regressions. As to second nature, pecuniary externalities seem to explain most of population growth differentials in the first period. In particular, the coefficient on market potential is positive and significant, which indicates that workers tend to move towards higher market potential locations. Moreover, the negative coefficient on distance from airports confirms that agglomeration takes place at or close to transport hubs.

There is, instead, no evidence of positive technological externalities as the coefficient on the density of population is actually negative (and significant in the 1987-1990 regression – Column 3). This result, however, holds only when the market potential is included in the regression. When it is excluded, the density term bears a positive coefficient, as consistent with the common view that migrants tend to move to higher density areas.

First nature effects are also important. The percentage of land covered by lakes appears to be relevant and positively influences population growth. On the other hand, the positive coefficient on distance from ports seems counterintuitive. However, it can be explained in the light of the bad economic situation of ports during the last decades due to industrial restructuring. This interpretation is supported by the fact that higher rates of unemployment and a higher share of manufacturing industries appear to depress population growth.

As to proximate sources, there is no evidence of a positive relationship between the level of education at the beginning of the period and population growth in the subsequent period. However, when we introduce the change in educational levels, this shows a significantly positive correlation with population growth in the period.

Turning to policy variables, the attractiveness of good infrastructures is revealed by the negative impact on distance from airports. As to international openness, the positive coefficient on the distance from the Russian border signals both the disadvantage of being far from Western Europe and the backslash of collapsing trade with the USSR for border regions.

Finally, the two measures of population growth lead to broadly similar patterns of results. The only difference concerns median age, which becomes insignificant in the regression for adjusted population growth (Column 2). It suggests that an older composition depresses population growth by reducing the demographic balance, rather than by altering the economic attractiveness of a region.
**Income**

Columns 4 and 5 report the results of per-capita income regressions. The negative and highly significant coefficient on the initial value of per-capita income reveals that the pre-recession period is characterised by a process of regional convergence in income per capita. Indeed, when included alone in the regression, initial income explains over 70 per cent of the variation in regional income per capita growth rates, thus signalling unconditional convergence. Nonetheless, decreasing returns to capital accumulation are not the only force at work. Pecuniary externalities are also important. The coefficient on market potential is positive and strongly significant as in the population regressions.

As in the population regressions, the coefficient of population density is significantly negative. However, the coefficient becomes not significant when market potential is dropped from the regression. Also the unemployment rate and the share of manufacturing have significant impacts as in the population regression. However, their signs are no longer both negative as income growth appears to be positively related to unemployment. Finally, distance-related variables other than market potential have no longer significant impacts.

**House prices**

The results of the house price regression in Column 5 complete the picture. The coefficient on the starting level of house prices is strongly negative. The fact that house prices grew faster where they were lower matches the population finding on people moving to less densely populated regions. The result might also reflect the fact that the overshooting of house prices in the growth centres observed in the early 1970s started to smooth down as the flow supply of housing increased in these areas and migration flows declined.

The role of market interactions receives additional support, whereas there is still no evidence of the relevance of technological externalities. In particular, the coefficient on market potential is again positive, whereas the density of population has once more a negative coefficient. As in the income regressions, the latter becomes not significant when market potential is dropped from the regression.

**3.4.2 After the recession**

The results for the post-recession period are presented in Table 2.
Table 2 – After the recession: 1994-2002 (‘high labour mobility’)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Income per capita</td>
<td>-1.421 **</td>
<td>-0.994 ***</td>
<td>-2.566 ***</td>
<td>-3.75 ***</td>
<td>5.388 ***</td>
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<tr>
<td>Density of population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House price</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Median age</td>
<td>-3.836 ***</td>
<td>0.722 ***</td>
<td>-1.310 **</td>
<td>-3.136 ***</td>
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<tr>
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<td>20.54 ***</td>
<td>9.931 ***</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Market potential</td>
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<td>0.378 ***</td>
<td>0.330 ***</td>
<td>0.937 ***</td>
<td>2.22 ***</td>
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<tr>
<td>Share of employment in ICT</td>
<td>0.056 ***</td>
<td>0.021 ***</td>
<td>0.085 ***</td>
<td>0.192 ***</td>
<td></td>
</tr>
<tr>
<td>Distance from main airports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance from Russian crossing borders</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Distance from ports</td>
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<td></td>
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</tr>
<tr>
<td>Unemployment rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of manufacturing and construction</td>
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<td></td>
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<tr>
<td>Lake covered land</td>
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</tr>
<tr>
<td>_cons</td>
<td>0.592</td>
<td>-6.606 ***</td>
<td>4.750</td>
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<td>-79.77 ***</td>
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<td>Number of observations</td>
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</tr>
<tr>
<td>R²</td>
<td>89%</td>
<td>86%</td>
<td>66%</td>
<td>70%</td>
<td>64%</td>
</tr>
</tbody>
</table>

Note(s): All explanatory variables are in log terms (apart from shares)
t-statistics are in parentheses (based on robust standard errors)
*** = significant at 1% level
** = significant at 5% level
* = significant at 10% level
+ = Population growth due only to net migration flows (net of natural balance)
$ = excluding outliers. Regions 1, 55, 56, 59
$$ = excluding outliers. Regions 3, 79
Population

In Table 2 Columns 1 and 2 report the outcomes of population regressions. There are four major changes with respect to the findings of the pre-recession period.

First, while the market potential maintains its positive significant coefficient, other proximity variables such as the distances from ports, airports, and the Russian border, are no longer significant, which points out a weakening of distance-related effects.

Second, the initial share of employment in ICT has a positive influence on growth. This result is very strong and very robust to changes in the specification of the regressions. Since ICT employment shares are not available before the recession, they were not included in the pre-recession regressions. These include instead manufacturing shares, which, as we have seen, have a negative impact on population growth. Together with the positive impact of ICT after the recession, that reveals the relevance of industrial restructuring.

Third, the level of education at the beginning of the period has now a strong positive effect on population growth. We find a positive impact also when we introduce the change in educational levels.

Fourth, population density does not have a significantly negative coefficient anymore. Moreover, the coefficient becomes significantly positive as soon as the market potential is dropped from the regression (more on this below).

The foregoing results hold for both measures of population growth. As in the first period, the only difference concerns the median age effect. However, differently from before, now the median age has a positive and significant coefficient in the regressions for adjusted population growth (Column 2).

Income

The results of the income regressions are reported in Columns 3 (taxable income) and 4 (primary income) of Table 2. Regressions estimated using all observations performed very poorly because of influential outliers. Columns 3 and 4 report the results of regressions estimated excluding the outliers. The market potential, the initial specialization in ICT, and the distance from the Russian border have positive impacts on income growth. Median age and unemployment rate have negative impacts. Population density has now no significant effect. Again, this coefficient becomes
significantly positive when the market potential term is dropped from the regression. This is consistent with previous findings in the literature.

The negative coefficient on the starting level of income per capita reaffirms the convergence effect observed in the first period. However, it is interesting to note that, before the recession, the coefficient of initial income is negative and significant even if initial income were included as the only explanatory variable (‘unconditional convergence’). Differently, after the recession, such coefficient is negative and significant only after controlling for other region-specific variables. This implies that in the post-recession period income differentials across regions have become persistent being determined by the differences in local characteristics (‘conditional convergence’).

**House prices**

In Table 2 Column 5 reports the results for the house price regressions. Three main points are worth noticing. First, the coefficient of initial house prices is positive and strongly significant. This implies that, after the recession, house prices have been growing faster where already initially higher. This result is robust to changes in specification and exactly opposite to what we obtained before the recession. It matches the lost significance of the population density coefficient in the second period. As it was the case in the population and income regression, the population density coefficient is not significant. However, once more, it becomes significantly positive when market potential is dropped from the regression.

Second, the positive impact of market potential is confirmed, while the distance from the Russian border has now a significant positive impact. In this respect, it is interesting to recall that the distance from Russia has also significant positive effects on population growth before the recession and on income growth thereafter but no effects otherwise. This reveals the role of migration in leading the transition from traditional activities (mainly linked to forestry) closer to the Russian border to new knowledge-based activities closer to the coast.

### 3.5 Discussion

In what follows we discuss our results under a twofold perspective. Firstly, with respect to the role of recession, the results suggest that it was indeed a watershed. Before the recession, our analysis uncovers a distinct pattern of convergence for income, house prices, and population. After the recession, income convergence goes from unconditional to conditional, implying that regional differences in levels become permanent. Moreover, there is no evidence of convergence in population anymore and house prices even diverge. This is consistent with a process of agglomeration that raises productivity and amenity in places crowded by firms and workers.
Secondly, with respect to the main drivers of regional asymmetries, as discussed in Section 2.3, we are able to determine the nature of their influence on regional performance by comparing the signs of the coefficients of the explanatory variables in the income and house price (or population) regressions. If a variable has positive (negative) coefficients in both regressions, then it has a positive (negative) impact on firm productivity. If a variable has a positive (negative) coefficient in the income regression and a negative (positive) coefficient in the house price regression, then it has a negative (positive) impact on worker utility.

A key variable is the market potential, whose relevance hints at the role of pecuniary externalities. This variable turns out to have a positive influence on income, house prices and population growth in both periods. This is clear evidence of a dominant positive impact of that variable on productivity and thus of pecuniary externalities: in the long run regions that enjoy better access to national markets tend towards higher levels of productivity. We do not find, instead, evidence of an independent role of technological externalities as proxied by population density. However, at least in the second period, when the market potential term is dropped from the regressions, the density of population influences positively population, income and house prices growth. This implies a positive impact on productivity, which is consistent with previous finding in literature. The results for the first period are similar but less clear cut, as the coefficient of population density is significantly positive only in the population regressions.

Turning to the other variables, there are clear indications of the effects of education and industrial structure. The level of education positively affects house prices in the first period and population growth in the second. Similarly, the change in the educational level also positively influences population growth in the second period and population and house prices in the first period. In both cases, the absence of any effect on wages signals a positive impact on both productivity and amenity (see Figure 2). The results therefore support the existence of both technology adoption and neo-classical accumulation effects of human capital. The negative impact of manufacturing and the proximity to ports in the first period as well as the positive impact of ICT in the second period reveal that the specialization in sunset industries is detrimental to regional productivity growth while sunrise industries have the opposite effect. As already mentioned, the fact that sunrise activities are disproportionately represented in urban areas close to the coast explains the evolution of the coefficients on the distance from Russia as migration flows promote the geographical reallocation of resources.

Some other variables have mixed effects. Unemployment has a negative impact on population growth and a positive impact on income growth in the first period. It has a negative impact on income in the second period. All this signals a dominant negative effect on amenity in the first
period. This effect turns positive in the second period but is accompanied by a negative effect on productivity. Median age has a negative impact on income and (unadjusted) population growth in both periods. This points at a negative influence on productivity. However, the negative impact on (unadjusted) population growth could also simply reflect a negative impact on the natural demographic balance, rather than on the economic attractiveness of the region. Indeed, the positive impact of age on (adjusted) population growth in the second period suggests a positive association of age with utility (with older people living preferably in higher amenity areas).

Finally, there are variables that lose their explanatory power in the second period. Distance from main airports has a negative effect on population growth in the first period but no effect whatsoever in the second period. This points at a negative influence on both productivity and amenity in the first period only. Lake covered land has a positive effect on population growth in first period but no effect in second one. This signals a positive influence on both productivity and amenity in the first period only. On the contrary, we do not find evidence of climate on productivity and amenity, neither in the first nor in the second period.

To summarize, we started the section asking whether there is evidence that migration fosters regional disparities. The analysis of Finland suggests that indeed the increase in labour mobility has been associated with a shift from unconditional to conditional convergence. This implies that income differentials across regions have become persistent being determined by the differences in local characteristics (‘conditional convergence’). The influence of these characteristics has been amplified by local externalities, especially of the pecuniary type, as the economy transformed from resource-based to knowledge-based.

.4 Do migrants’ characteristics foster disparities?

In the previous section we have provided evidence that, in the presence of localized externalities, labour mobility fosters regional disparities. We now move one step further and deepen the analysis of the sources of those externalities reporting the findings of a study by Bellini, Ottaviano, Pinelli and Prarolo (2008) across the NUTS 3 regions of 12 countries of the EU15 (Austria, Belgium, Denmark, France, former Western Germany, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom) in years 1991 and 2001. In particular, we ask whether there is any evidence on the mechanism underlying the workings of local externalities that are strictly related to migration per se.
4.1 Cross-country analysis

Bellini et al (2008) rely on the cross-section dimension of the analytical framework presented in Section 2.3. Their hypothesis is that immigrants carry attributes that are complementary to the ones of the native population and this should materialize as a positive productivity effect in the host region. Operationally, the local characteristic we add to the list of wider influence in Section 3.3.2 is the share of foreign born in the resident population where the focus of foreign migrants is due to the lack of comparable cross-country quality data on native migration among NUTS 3 regions. In the presence of native-immigrant complementarities, a larger share of foreign born should be associated with higher wages and higher land rents.

The analysis is carried out in three steps. First, we estimate the wage equation. As wage data for European regions and cities are scattered and not available at NUTS 3 level, we use GDP per capita as a proxy. Under the assumption of free firm mobility the two measures are equivalent, as profits are equalised across regions and income differentials are entirely driven by wage differentials.

Second, we estimate the rent equation. EU-wide comparable data for land rents at NUTS 3 level are not available (and data for a close proxy such as house prices are only available for a restricted number of major cities). However, according to the analytical framework, rents de facto capture the prices of non-tradables, which we proxy by the average prices (in logs) of two-forchettes restaurants. Restaurant prices have been chosen because they are typically highly correlated with the prices of non-tradables, in particular of land. They are derived from the Michelin Guides of each country for the reference years. By exploiting the rating system of Michelin we have constructed price indexes that refer to restaurants of comparable quality across countries and cities. In particular, the restaurant price for each region is calculated by averaging across the prices of all two-forchettes restaurants reported in the guide for that region, excluding fixed-price menus.

Third, since our independent variable (diversity) is potentially endogenous we perform instrumental variables (IV) estimations in order to net out the (possibly positive) effect running from wages and the (possibly negative) effect running from rents to diversity. In fact, since migrants are more mobile than natives, an exogenous positive shock in wages should attract relatively more migrants than natives, leading to an increase in diversity. Conversely, an exogenous positive shock in the land rent should lead to less diversity.

The very poor quality of education data for 1991 does not allow us to estimate growth regressions with reliable controls as in Ottaviano and Pinelli (2006). That is why we perform a cross section
analysis using only 2001 data and exploiting 1991 data to construct the instruments that allow us to deal with endogeneity and reverse causation.

4.1.1 Income regressions

The basic equation we estimate is the following:

\[
\ln y_c = D_r + \beta \text{div}_c + \phi X_c + e_c
\]

where \(c\) indexes the NUTS 3 province. Once we exclude formerly Eastern Germany provinces, we have 844 NUTS 3 observations and a number of NUTS 2 regions equal to 171: the average number of provinces included in a region is around five. As discussed above, the dependent variable (\(ln y_c\)) is GDP per capita (in logs). The key explanatory variable is the province’s diversity (\(\text{div}_c\)) as a proxy of migrant-native complementarities. We use two measures of diversity: the Simpson index, which accounts for the distribution of the entire population across national groups and the simple share of foreigners in total population, in some specifications coupled with the Simpson index calculated only among foreigners. We include a set \(X_c\) of standard control variables as in Section 3.3, such as the share of agriculture in total employment (\(agric\)) to control for differences in industrial structure and the share of inhabitants with at least secondary education (\(edu_c\)) to control for differences in human capital endowments. As before, we introduce the density of population (\(dens_c\)) to control for technological externalities and market potential (\(mpot_c\)) to control for pecuniary externalities. In all regressions, we introduce NUTS 2 region fixed effects, \(D_r\). Region fixed effects (\(D_r=1\) for the all the NUTS 3 regions belonging to a specific NUTS 2 region; 0 otherwise) control for those characteristics, such as institutions and other NUTS 2-specific variables that apply to all the provinces (NUTS 3). When NUTS 2 fixed effects are introduced, only the provincial deviations from the NUTS 2 baseline is left to be explained. In Section 3, the richer availability of regional characteristics would have made the introduction of NUTS 2 fixed effects redundant.

Table 3 shows the results of the basic income regressions estimated by OLS. Robust standard errors are also reported in brackets because, as already argued, heteroskedasticity often characterises cross-regional analyses. Columns (1) and (2) report the results of specifications where the only regressors are the overall Simpson index and the share of foreigners plus the Simpson index calculated among foreigners only. The diversity indices are positive and strongly significant, suggesting positive correlations with the log of GDP per capita, which is our wage proxy. NUTS 2 dummies already explain a lot of variation: regressions including NUTS 2 dummies alone show R-squared around 0.69. Nonetheless, the inclusion of diversity indices significantly adds explanatory power. In columns (3) and (4) we replicate the two previous estimations adding some of the
controls described above. The coefficients of diversity indices are a bit smaller but still strongly significant and the coefficients of controls show expected signs, except the one of market potential that is, however, not significant. The share of agriculture has a negative coefficient, which is significant in column (3), consistently with most findings in literature. The human capital variable has a positive and strongly significant coefficient, consistent with the growth literature. Finally, the density of population has a positive coefficient hinting at positive technological externalities.

### Table 3 – Wage regression OLS

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<th>(3)</th>
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<td></td>
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<tr>
<td>Human Capital</td>
<td>0.02387***</td>
<td>0.02138***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.00436]</td>
<td>[0.00490]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>0.00001*</td>
<td>0.00002***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.00001]</td>
<td>[0.00001]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Potential</td>
<td>-0.00001</td>
<td>-0.00001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.00001]</td>
<td>[0.00001]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUTS 2 Dummies</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Observations</td>
<td>787</td>
<td>787</td>
<td>679</td>
<td>679</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.80</td>
<td>0.82</td>
<td>0.88</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Robust standard errors in brackets. Observations are weighted for working population.

* significant at 10%; ** significant at 5%; *** significant at 1%

Under the realistic assumption of limited labour mobility, in the light of Figure 2 such results would point at a positive effect of diversity on firms’ productivity. Nevertheless, in the presence of labour mobility, higher wages in more diverse regions could simply reflect aversion to diversity rather than a genuine effect on productivity. To rule out this possibility, we now study the relationship between diversity and local prices.

#### 4.1.2 Price regressions

We estimate the following price regression:

\[
\ln p_c = D_r + \gamma \text{div}_c + \phi X_c + e_c
\]
where the dependent variable \((\ln p_c)\) is the log of average restaurant price in the NUTS 3 region. As before, the key explanatory variable is the regional diversity \((\text{div}_c)\). Standard control variables are included together with NUTS 2 region fixed effects, as in the income regression.

Table 4 shows the results of the prices regressions following the same structure of Table 3. All regression have large explanatory power once we control for NUTS 2 fixed effects. This implies that most of the variation in restaurant prices is not explained by local NUTS 3 characteristics but possibly by less ‘local’ determinants. However, coefficients are positive and significant for all the diversity measures, thus revealing a (small) positive relation between diversity and land rents. This small effect is consistent with low labour mobility and thus a vertical free migration condition. The coefficients of control variables are never significantly different from zero. The exception is the coefficient on the share of agriculture. This is negative and marginally significant in specifications (3) and (4), confirming that a higher specialisation in agriculture is negatively associated with productivity.

Table 4: Non-tradables price regression OLS

<table>
<thead>
<tr>
<th>Dep. Variable: log(RestPrice)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simpson Index</td>
<td>1.64327***</td>
<td>1.80630***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[0.33582]</td>
<td>[0.48860]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of Foreigners</td>
<td>1.14742***</td>
<td>0.90911***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[0.27731]</td>
<td>[0.31238]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simpson Index Among Foreigners</td>
<td>0.24145***</td>
<td>0.18509***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[0.08272]</td>
<td>[0.08788]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of Agriculture</td>
<td>-0.00486</td>
<td>-0.00510*</td>
<td></td>
<td></td>
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<tr>
<td>[0.00299]</td>
<td>[0.00294]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>0</td>
<td>0.00001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[0.00001]</td>
<td>[0.00001]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Potential</td>
<td>-0.00001</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[0.00001]</td>
<td>[0.00001]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUTS 2 Dummies</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Observations</td>
<td>686</td>
<td>686</td>
<td>630</td>
<td>630</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.96</td>
<td>0.96</td>
<td>0.97</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Robust standard errors in brackets. Observations are weighted for working population.

* significant at 10%; ** significant at 5%; *** significant at 1%

Following our identification strategy, the positive signs of the diversity measures’ coefficients rule out the possibility that diversity acts as a consumption disamenity and, thus, point out a positive correlation between diversity and productivity.
4.1.3 Instrumental variables

Short of a randomized experiment, we cannot be sure that the positive correlation found between diversity and productivity reveals a causal link from the former to the latter due to possible reverse causation. We address this concern through instrumental variables (IV). The idea is to substitute our potentially endogenous diversity measures by a set of proxies correlated with diversity within regions in 2001 but not otherwise correlated with the residuals of regressions (9) and (10). To this end, we use the ‘shift-share methodology’, whose key idea is that migrants tend to settle close to where migrants of the same origin already reside. Accordingly, the predicted end-of-period composition of a region’s population in 2001 can be computed on the basis of its beginning-of-period composition in 1991 by attributing to each group in the region its average growth rate in the country to which the region belongs to from 1991 to 2001. This way the predicted composition in 2001 should be independent from (i.e., exogenous to) region-specific shocks occurred from 1991 to 2001. Alternatively, one could use the average growth rate in the EU as a whole. We prefer the national growth rate as there are differential behaviours of different ethnic groups that are country-specific. These differential behaviours arise from the heterogeneous nature of European countries’ populations: different languages, different colonial history of sending countries and different cultures. In Figure 3 and Figure 4 (where “Rest” indicates foreigners from Oceania and unknown origin) we report the composition of foreign population for years 1991 and 2001 respectively. It is easy to spot patterns that are more likely to be country-specific than widespread across European countries.

![Figure 3: Composition of foreign population in 1991](image)

Figure 3: Composition of foreign population in 1991
The results of the IV estimations of wages and prices regressions are reported in Table 5. In the wage regressions the coefficients of both the Simpson Index and the share of foreigners turn out to be smaller than the OLS estimates in Table 3 but still strongly significant. The smaller magnitude of coefficients imply that the positive ‘pull effect’ of previous migrants going to places with higher wages has been netted out by the instrument. In fact, the first stage regression shows large F-tests and not negligible R-squared, indicating that instrument is not weak. The coefficients of the Simpson Index among foreigners also remain positive but lose their statistical significance. Finally, the controls show similar values and are always significant as in Table 3, with the exception of market potential.

In price regressions the previously described ‘pull effect’ of previous migrants should be negative: we expect that, other things being equal, migrants decide to settle in places where prices are lower. This seems indeed to be the case when we instrument the Simpson Index: its coefficient becomes bigger, meaning that, if any, the effect of the price level on diversity is negative, leading to downward biased estimates in specification (3) of Table 3. Turning to the last specification, the coefficient on the share of foreigners is not significantly different from the OLS regression and the coefficient on the Simpson Index among foreigners is not significant.

Overall, the values and the pattern of significance of the IV results trace the ones of the OLS specifications (3) and (4) in Table 3, pointing at a positive causal relationship from diversity to productivity possibly accompanied by an amenity effect of diversity on consumption.
To summarize, we started the section asking whether there is any evidence on the mechanism underlying the workings of local externalities that are strictly related to migration per se. The analysis of European NUTS 3 regions suggests that migrants bring ineed some attributes with them that complement the attributes of the native workforce, thus boosting its productivity.
.5 Conclusion

The paper has tackled the question whether and why labour mobility fosters or hampers regional disparities. In so doing, it has presented the findings of two studies on Finland and a set of other European countries.

The study on Finland suggests that internal labour mobility indeed fosters regional disparities, especially in economies increasingly specialized in sectors characterized by intense scale economies (internal or external to the firm), strong market power, tight input-output relations, higher relative intensity of mobile than immobile factors (such as capital and skilled labour versus land and unskilled labour), rapidly changing products and tasks (as in hi-tech industries), high value added (that is, small congestion cost per euro produced). In addition, the cross-country study on other European countries shows that international labour mobility may fuel further regional divergence as migrants bring some attributes with them that boost local productivity thanks to complementarities with the attributes of the native workforce.

From a policy point of view, this evidence implies that labour mobility can be a powerful driver of productivity growth but unfortunately not of regional convergence.

References


