

A Regional Development Ecosystem Framework: Place, People and Economy in European Regions and Their National Systems

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Abstract

In this paper I propose a framework for understanding regional economic development as an ecosystem, in which three domains, Place-based Conditions, Human and Social Capital and Economic Activity, act on one another and do not add up as separate factors. European regional disparities have persisted despite roughly 1.5 trillion euro of cohesion funding since 1989. A gap has also grown between what aggregate indicators report and what people in those regions experience. My premise is that neither is well explained by approaches that treat infrastructure, human capital and economic performance one at a time. A substantial literature already establishes that these domains interact, one pair at a time, and several measurement traditions already score regions on many dimensions side by side. However, neither models the system as a whole. The framework draws these strands together by naming the enabling, mediating and feedback mechanisms that run between the three pillars and giving each its precedent in the literature, and from them I derive five propositions about how regions should behave in calm conditions and under a shock, which the empirical companion tests on European NUTS 2 data. The framework is presented as a dynamic system, in which regions settle into stable but shiftable configurations. Its unit is the region inside its national system, since the level a region settles at is set largely by its country, and the regional part is the balance between the pillars and the speed at which an imbalance is corrected. In the companion, the euro crisis, which entered through the economy, pulled the economic pillar away from the social and territorial ones, which is the pattern the framework implies. The pandemic, by contrast, arrived through a different channel and did not separate them. This paper is the first of a sequence. It is followed by the empirical test and by a linear state-space model of the ecosystem, fitted to an annual panel of European regions from 2000 to 2023 in the form ecologists use to estimate a community matrix from time series.

Section 1: Introduction

1.1 The decoupling of wellbeing from prosperity

The framework starts from an anomaly that the standard account of development cannot absorb, which is that across European and OECD populations several independent measures of wellbeing have stagnated or fallen even as material wealth has risen. Lima de Miranda and Snower (2020) show that social affiliation and individual empowerment, the solidarity and agency dimensions of their ‘SAGE’ framework, moved apart from GDP per capita over 2007 to 2017. Conway (2020) embeds those wellbeing dimensions in a heterogeneous-agent macroeconomic model and finds that they decouple from consumption under shocks. The divergence is therefore structural, and it is not an artefact of any one measure. Inequality accounts for only part of it, since the relationship between wellbeing and income inequality is loose and across regions wellbeing remains clearly separable from inequality alone, so that distributional correction does not close the gap. The OECD (2020) How’s Life survey reports that 7% of the OECD population records very low life satisfaction, and that 15% of women and 12% of men feel more negative than positive on a given day. It also reports that almost 40% of households are financially insecure, at risk of poverty if they lost three months of income. Case and Deaton (2015, 2017) document the sharpest instance, a rise in midlife mortality among white Americans without a university degree, even as aggregate output recovered. The rise was driven by deaths from drugs, alcohol and suicide, which in the worst-affected states came to rival other leading causes of death. If development were a single unit, wellbeing could not fall while wealth rises. For this reason I take the decoupling as the first sign that development is made of interacting parts that can come apart, which is the question the framework is built to organise.

None of this is new to the measurement debate, which Section 2.5 takes up. Models built around GDP growth have nevertheless come to misrepresent the regional development they are meant to summarise. I would argue that single-dimension approaches are flawed in theory, since they assume that a complex multi-dimensional process can be understood through one factor at a time, and in practice material prosperity has become disconnected from the social and individual dimensions that make development meaningful for citizens.

1.2 The persistence of regional disparities despite massive policy interventions

Since Cohesion Policy was formally established with the Delors package of 1987 to 1988, the EU has allocated approximately 1.5 trillion euro across six programming periods, rising from 63 billion euro in 1989 to 1993 to 392 billion euro in 2021 to 2027. With national co-financing, this is the largest commitment of its kind to date (Prota, Viesti and Bux, 2020; European Commission, 2021). Yet regional disparities across Europe have persisted, and in many cases deepened. By the end of 2023, three years into the 2021 to 2027 period, payments amounted to only 3.2 per cent of the period’s total (European Court of Auditors, 2024). A late legal framework made this worse, since the common provisions regulation was only adopted in June 2021, six months after the period had begun (European Union, 2021).

Disparities have also widened along more than one axis. Regional gaps within member states have grown even where national economies converged, which is the familiar pattern of left-behind regions inside prosperous countries, although the gap between countries remains the larger share of the total. Measured by the coefficient of variation of GDP per capita, regional disparities rose after the 2008 financial crisis and again during the pandemic (IMF, 2022). The gains of the early 2000s had already

been erased on the eve of the Great Recession, and the divergence accelerated afterwards, mostly between countries during the 2020 shock.

Iammarino et al. (2019) document the formation of regional clubs with divergent and self-reinforcing trajectories, and Rodríguez-Pose (2018) sets out the political consequences, with anti-establishment voting concentrated in economically marginalised regions. Similar levels of investment produce very different outcomes across regions. The persistence of divergence despite unprecedented intervention therefore suggests that the conventional account of regional development is incomplete.

Absorption has been weakest in the largest beneficiary states. It has also run lower in the 2021 to 2027 cycle than in 2014 to 2020 (European Parliament, 2024). This is the present-day form of the paradox, with funds committed faster than they can be turned into outcomes on the ground. Where Central and Eastern European regions did converge on the EU-15, the gains were concentrated in capital and urban regions, while less-developed regions caught up only slowly despite cohesion funding (Egri and Lengyel, 2023). This suggests that transfers do not deliver convergence on their own, without the institutional and social conditions to go with them. The standard accounts do not explain why convergence policies so often fail to produce convergence, and in my view this points to a misunderstanding of how development works.

The inequalities in question are not only about income. Educational attainment clusters in space, and the newer digital divides follow the same geography, so that new forms of exclusion land on top of existing disadvantage. Network structures are also closely tied to social mobility (Chetty et al., 2022). In essence, single-factor interventions fail because the inequalities they target work as an interconnected system, in which disadvantages compound one another across dimensions.

The political consequences appear in the rise of anti-establishment movements in Europe’s economically marginalised regions. Rodríguez-Pose (2018) describes the revenge of the places that do not matter. The geography of the Brexit vote, the gilets jaunes and the Five Star Movement follows regions of long-term decline. Dijkstra et al. (2020) map this discontent across regions and tie it to long-term economic and industrial decline. Since 2016 the label of left-behind places has acquired a geography and a critique of its own (Pike et al., 2024; MacKinnon et al., 2022), and Rodríguez-Pose, Dijkstra and Poelman (2024) link the discontent to the regional development trap. The social side has eroded over the same period. Putnam (2015) documents community breakdown in deindustrialised areas, and Antonakakis and Collins (2014) link austerity to rising suicide. Across the EU, single-person households have become the most common and fastest-growing household type (Eurostat, 2026), and loneliness rose sharply during the pandemic (Baarck et al., 2021). For these reasons, I would argue that approaches which ignore the social dimension undermine their own foundations.

1.3 The limitations of single-domain approaches

Current approaches typically examine physical infrastructure, human capital or economic performance in isolation, and so miss the interdependencies that determine actual outcomes. Southern Italy is the clearest illustration. Italy has been allocated more than 30 billion euro from the ERDF and the ESF+ for 2021 to 2027, part of its total of 42.7 billion euro in cohesion funding (European Commission, 2022). Yet the North-South gap remains intractable. Per capita GDP in the South was about 57 per cent of that in the Centre-North in 2023 (ISTAT, 2025), and the two have diverged over the decades in which Cohesion Policy has operated (Fanti, Pereira and Virgillito, 2023). After decades of substantial investment, the South has not converged and has in fact declined in relative terms. The infrastructure-led approach that dominated Italian cohesion policy proved insufficient

without complementary institutional reform and capacity building, which the framework I develop here treats as inseparable from it.

The same pattern appears elsewhere in Europe. The returns to public investment in European regions are strongly moderated by the quality of regional government (Rodríguez-Pose and Garcilazo, 2015), and basic territorial conditions can also act as gateways that constrain development regardless of other strengths (Di Cataldo and Rodríguez-Pose, 2017). These are interaction effects, yet most analyses treat the factors separately. In my view this is why they cannot account for identical investments yielding such different results.

Place-based approaches (Barca, 2009) are an advance over spatially blind policy, but their implementation remains fragmented and theoretically underdeveloped. Barca called for integrated territorial approaches, yet cohesion policy maintains sectoral divisions. The ERDF, ESF+ and Cohesion Fund operate separately despite affecting the same regions, and coordination between infrastructure, human capital and business-support interventions remains limited. Academic evaluation of cohesion-policy effectiveness is also mixed, with estimates ranging from positive but short-lived effects to negligible or context-dependent ones (Becker, Egger and von Ehrlich, 2010, 2013, 2018; Mohl and Hagen, 2010; Pellegrini et al., 2013; Cerqua and Pellegrini, 2018; Crescenzi and Giua, 2020). For place-based policy to deliver on Barca’s original ambition, it needs frameworks that capture how territory is embedded within broader social and economic systems, instead of treating place as one factor among many.

1.4 The contribution of this paper

In this paper I propose an ecosystem framework in which regional development emerges from the interactions between Place-based Conditions, Human and Social Capital, and Economic Activity. It builds on Barca’s (2009) place-based approach and extends it through systematic multi-dimensional integration. I also draw on Chetty et al.’s (2022) economic connectedness, on Hidalgo and Hausmann’s (2009) economic complexity, which I widen to include social and territorial activation, and on Martin and Sunley’s (2015) resilience as a property emerging from the interplay of a region’s parts.

This paper does not build a new composite indicator of regional development, and it does not rank regions. Several good indices already exist for both purposes, and Section 2 discusses them. Instead, I propose a framework of how three domains of development act on one another. The three pillars are a way of organising the mechanisms and should not be read as three separate measurements, and for this reason more of the paper is spent on the pathways between the pillars than on the pillars themselves. In Section 3 each pathway is named, given its precedent in the literature and stated as a direction of influence that can hold or fail. Five propositions about how European regions should behave in calm conditions and under a shock follow from the pathways. The empirical companion tests them on NUTS 2 data. In other words, the contribution is the assembled system and its testable implications, and the composite that appears in the companion is only a by-product of the test.

The framework is not the first to notice that these dimensions interact, since the work reviewed in Section 2 establishes such interactions empirically, if only two factors at a time. The three pillars are also not three statistically separable dimensions of regional life. In the empirical companion a single general factor of development fits the indicators better than three, so I use the pillars as a way of organising the scattered evidence on interactions into one structure, and their combined score only as an instrument of the test.

The unit of the framework is the region inside its national system. Most of the difference in develop-

ment between European regions lies between countries. The companions find that the level a region settles at is set largely by its country. For this reason the framework does not treat the region as a self-contained economy, and asks what is regional within that national setting. The answer it gives is the balance between a region's three pillars, the speed at which an imbalance between them is corrected, and the position a region holds within its own country, which is also the scale at which cohesion money is delivered.

I present the framework as a living system, and it is not meant as a fixed taxonomy. Regions are coupled wholes that settle into stable but shiftable configurations, and they change as the world economy, demographics, and their own opportunities change. For instance, a region may move to a new equilibrium through a shift into research and innovation, and that equilibrium is not necessarily higher on output, only a different stable state. The framework is meant to capture how those configurations hold and change, without fixing regions to permanent categories.

1.5 The nature of the contribution: a synthesis

This is a conceptual paper of the synthesis kind (Jaakkola, 2020), whose task is to integrate fragmented and previously disconnected findings into a higher-order organisation. It does not deduce a framework from prior axioms, since no unified prior account exists to deduce from. I offer the three-domain organisation by inference to the best explanation, as the most parsimonious structure that makes sense of two independent bodies of evidence together:

- The decoupling puzzle set out above, which establishes that economy alone is not the whole of development and that the people-side and the territorial side must enter the account as distinct from output.
- The pairwise interaction literature reviewed in Section 2, which finds the domains coupled but only two at a time, never assembled as a single system.

Independent multidimensional accounts of development and wellbeing reinforce this without settling it. They reject the single-output view and reduce to a small set of interacting domains, which shows that a low-dimensional organisation is not idiosyncratic to this paper, although it does not by itself fix the number at three. I chose three for parsimony, as the smallest partition that keeps territory, people and economy distinct enough to specify mechanisms between them. Whether that cut is durable or arbitrary is an empirical question, which the companion takes up.

This paper is the first of a sequence. It sets out the framework, and the empirical companion (Conway, in preparation, a) tests it and reports that the structure is a ladder of tiers, set largely by the country, and not three separable dimensions. A third paper (Conway, in preparation, b) estimates the dynamics that this framework describes with a linear state-space ecosystem model, in the form ecologists use to estimate a community matrix from time series (Ives et al., 2003), fitted to 210 regions over 2000 to 2023 with national conditions and cohesion payments as inputs, and it asks what holds a region at its level and how fast it corrects an imbalance between its pillars. My aim throughout is an account of regional development as an interconnected system that can be defended empirically and that brings together a literature which has so far addressed that system only in parts. The remainder of the paper proceeds as follows. Section 2 reviews the literature and identifies where it stops, with particular attention to the methodological reasons. Section 3 sets out the framework, its three pillars and the mechanisms between them. Section 4 states the propositions the framework commits to and the data on which they can be tested. Section 5 draws out the implications for policy, reports what the companions find, and sets out the modelling work that follows.

Section 2: The literature and its limits

The literature relevant to this framework is large and much of it is good. However, two methodological limits recur in it. First, the studies which model interactions between domains do so one pair at a time, holding the rest of the regional system fixed, so that each establishes a mechanism and none can say how the mechanisms combine. Second, the frameworks which do span several dimensions are measurement instruments, which score dimensions side by side, usually with fixed weights, and specify no interaction between them. The review below runs through the main strands in turn and returns to these two limits at the end, because the framework of Section 3 is built on them.

2.1 Why integrated approaches have not succeeded before

Traditional approaches deliberately reduced complexity for analytical tractability. Models simplify the dynamics at play to make essential mechanisms discernible, and the price of that trade-off was an understanding of development one mechanism at a time. EU regional policy, for its part, has been delivered through separate funds and sectoral programmes, a design the Barca report argued should give way to integrated, place-based strategies (Barca, 2009). As a result, both research and policy missed the interdependencies that effective regional development depends on.

The record of the policies that did try to work across domains points the same way. Evaluations of Smart Specialisation find that implementation succeeds where governance and institutional capacity are already strong and struggles in lagging regions. The outcomes across Europe have therefore been uneven (Papamichail, Rosiello and Wield, 2023; Iacobucci, 2014). Poland is a case in point. Despite substantial investment in research infrastructure, its R&D intensity was only about 1.4% of GDP in 2020 (Eurostat, 2021), and although it climbed to around 1.6% by 2023 it stayed below the EU average (Eurostat, 2024). In other words, financial transfers alone do not generate innovation capacity without complementary reform in education, institutions and business culture. Infrastructure investment likewise delivers limited returns on its own, since its effect on regional growth in the EU depends on the other endowments of the region that receives it (Crescenzi and Rodríguez-Pose, 2012b).

The evaluation literature on cohesion policy reaches a conditional verdict. Regression-discontinuity estimates at the Objective 1 threshold find positive effects on regional growth (Becker, Egger and von Ehrlich, 2010, 2018; Pellegrini et al., 2013). However, the effect depends on the absorptive capacity of the receiving region, its human capital and its quality of government (Becker, Egger and von Ehrlich, 2013). It also diminishes at high transfer intensity (Becker, Egger and von Ehrlich, 2013; Cerqua and Pellegrini, 2018) and differs across member states (Crescenzi and Giua, 2020), and on panel methods it appears only for the most concentrated funds (Mohl and Hagen, 2010).

Data, methods and institutional learning now make integrated approaches feasible. New data sources allow regional analysis at a granularity that was not available before. Multi-dimensional indices, network analysis and machine learning make it possible to study many variables together. For instance, Chetty et al.'s (2022) connectedness measures draw fine-grained evidence on mobility from large anonymised datasets. With these advances an ecosystem approach can be attempted, where the analytical complexity of the problem previously ruled it out.

2.2 Early systems thinking in regional development

Cooke's (2001) regional innovation systems recognised early that innovation emerges from interactions between firms, institutions and knowledge infrastructure, and not from individual actors. Cooke defined the regional innovation system as clusters of innovating firms surrounded by suppliers and research institutions, with the emphasis on system properties, collective learning, institutional thickness and associative governance, and when applied across EU regions the framework revealed the importance of regional specificity. Its focus, however, remained on innovation and never widened to development as a whole.

Boschma (2015) and Martin and Sunley (2015) advanced ecosystem thinking through evolutionary approaches that emphasise adaptation and resilience as system properties. Boschma (2015) treats regions as complex adaptive systems with co-evolving economic, institutional and social dimensions, and finds that path dependence operates through related variety, with new activities emerging from existing capabilities. For Martin and Sunley (2015) resilience is an adaptive capacity that emerges from the characteristics of the system as a whole, and no single attribute supplies it. These approaches pointed towards integrated frameworks, but never operationalised them systematically across several development dimensions.

The regional resilience literature that grew out of the 2008 crisis asks how regions respond to a shock and why some recover and others do not. Martin (2012) separates resistance, recovery, re-orientation and renewal, and shows that recessions leave lasting marks on regional employment. Fingleton, Garretsen and Martin (2012) trace the resistance and recovery of British regions across four recessions. Fratesi and Rodríguez-Pose (2016) find that the European regions which lost least employment in the crisis were the sheltered ones, with larger public sectors and less exposure to trade. The two-shock design of the empirical companion is a resilience design in this sense. However, in the framework resilience is a response to a particular channel of shock. It is not a fixed property of the region, so the same region can hold under one shock and give under another.

2.3 Network approaches and social embeddedness

Social capital research showed how relationships and community structures shape development beyond individual capabilities or resources. Coleman (1988) located social capital in the structure of relations between actors, and not in individuals, and Putnam (1993) showed that Italian regions with stronger civic traditions had better institutional performance and economic development. Granovetter (1973) established the strength of weak ties, with different network types serving different economic functions. This research exposed the inadequacy of purely economic accounts, yet it still needed to be integrated with territorial and institutional factors.

Chetty et al. (2022) then showed that economic connectedness, the share of high-status friends among people of low socioeconomic status, is among the strongest predictors of upward income mobility identified to date. It correlates with upward mobility at 0.69 across US ZIP codes and 0.65 across counties. It remains a strong predictor when local income levels are controlled for, whereas income measures lose much of their predictive power. If low-status children grew up in counties with the connectedness of the average high-status child, their adult incomes would be about 20% higher on average. The authors point to information about opportunities, aspirations, mentorship and job referrals as likely channels, without testing them. Network research therefore points to a social activation mechanism for development, although it leaves open where the differences in network structure come from.

2.4 Territorial innovation and economic complexity

The standard account of why economic activity concentrates is agglomeration. Krugman (1991) showed that increasing returns, transport costs and mobile labour are enough to produce a core and a periphery from an even start. Storper (2013) traces the same concentration to the interaction of specialisation, institutions and social networks in cities. The framework complements this account by asking why a region cannot use what it has, once agglomeration has settled where activity concentrates.

Crescenzi and Rodríguez-Pose (2012a) developed an integrated framework linking territorial assets, innovation inputs and socioeconomic conditions. In their account innovation depends jointly on R&D, socioeconomic context and geography. Territories with appropriate social structures, the social filter of Rodríguez-Pose and Crescenzi (2008), translate inputs into innovation more effectively. Crescenzi, Rodríguez-Pose and Storper (2007) found European regions more dependent on local conditions than US regions. Crescenzi and Rodríguez-Pose (2012b) found that infrastructure investment raises growth only where the surrounding conditions allow. This work also shows what an integrated framework can do, although its subject is innovation and not development as a whole.

Hidalgo and Hausmann (2009) and subsequent regional applications showed that the sophistication of productive structures predicts development trajectories better than traditional measures. At the level of countries, economic complexity predicts future growth better than measures of governance, education or competitiveness (Hausmann et al., 2014), and the product space shows that economies diversify into activities related to those they already have (Hidalgo, Klinger, Barabási and Hausmann, 2007). Regions diversify in the same way, into industries related to those already present (Neffke, Henning and Boschma, 2011). Balland et al. (2019) apply this to EU regions and argue that smart specialisation requires an understanding of existing capabilities. Complexity approaches reveal structural determinants of development, and in my view they need to be joined to the social and territorial dimensions through which capabilities accumulate.

2.5 Where the literature stops: the ecosystem gap

The measurement debate is old, and its diagnosis is settled. Sen (1999) had already reframed development as the expansion of freedoms when the Stiglitz, Sen and Fitoussi Commission (2009) documented the systematic exclusions of GDP-centred accounting, with environmental degradation left unmeasured, income distribution masked by aggregates and quality-of-life factors ignored despite their effect on productivity, and a generation of multidimensional measurement followed.

Several established frameworks already describe European regions on multiple dimensions, so multidimensionality as such is not the contribution here. These frameworks all score dimensions alongside one another without modelling how the dimensions act on each other. The EU Social Progress Index (Annoni and Bolsi, 2020) ranks NUTS 2 regions on basic needs, foundations of wellbeing and opportunity, deliberately excludes the economic dimension so as to complement GDP, and specifies no interaction between its components. The EU Regional Competitiveness Index (Annoni and Dijkstra, 2019) aggregates eleven pillars through a fixed weighting scheme, is concerned with competitiveness more than with inclusive development, and gives no account of how the pillars condition one another. The OECD regional well-being framework (Veneri and Martin, 2019) presents eleven dimensions as a dashboard with equal weights and no theoretical aggregation, which makes it a monitoring instrument and not a generative model. Camagni and Capello's (2013) territorial capital, operationalised by Fratesi and Perucca (2018), supplies a rich taxonomy of regional assets, although as an account

of endowments it does not specify how the dimensions interact. These are measurement traditions, and valuable ones, but none states how territory, people and economy act on each other, which is the question an ecosystem framework must answer.

Separately from the measurement frameworks, a body of empirical work does model the interactions, but only one pair of factors at a time and never as a single system. Rodríguez-Pose and Ketterer (2020) find that improvements in institutional quality drive growth in lagging regions, and that the effect is moderated by the structure of the local economy. Muringani, Fitjar and Rodríguez-Pose (2021) find the economic return to bridging social capital conditional on a region’s human capital, with the two acting as partial substitutes in high-skill regions. Cortinovis, Xiao, Boschma and Van Oort (2017) find that formal and informal institutions jointly drive regional diversification, with a combined effect larger than either alone. Charron and Rothstein (2018), across 206 regions in 24 countries, find the quality of regional government, meaning impartial and uncorrupt public services, to be the strongest determinant of differences in generalised trust between regions of the same country, a direct pathway from the territorial to the social. Each of these isolates a single cross-term while holding the rest of the regional system fixed. As a result, the literature can show that the domains interact, and in which direction for a given pair, but not how the pairs fit together, since a study that holds the rest of the system fixed cannot observe it. The contribution of the present framework is to bring these scattered pairwise findings, and the side-by-side measurement traditions above, into one organisation that treats territory, people and economy as a single interacting system, which the empirical companion then tests.

Section 3: The Regional Development Ecosystem Framework

3.1 Framework architecture and theoretical foundations

The framework conceptualises regional development through three interconnected pillars, Place-based Conditions, Human and Social Capital, and Economic Activity, each necessary but insufficient alone. Basic territorial conditions act as gateways to development (Di Cataldo and Rodríguez-Pose, 2017). Social networks are closely associated with the economic outcomes individuals reach, including upward mobility (Chetty et al., 2022). Economic structures determine future possibilities (Hidalgo and Hausmann, 2009), and resilience emerges from the interaction of several dimensions and from no single one (Martin and Sunley, 2015). Organising the indicators into three domains keeps the analysis clear, while the interactions between the pillars keep it faithful to how complex the system actually is. The boundaries between the pillars are organisational, in that they are a way of grouping territory, people and economy for analysis and make no claim that the three are cleanly separable, which the companion paper finds they are not.

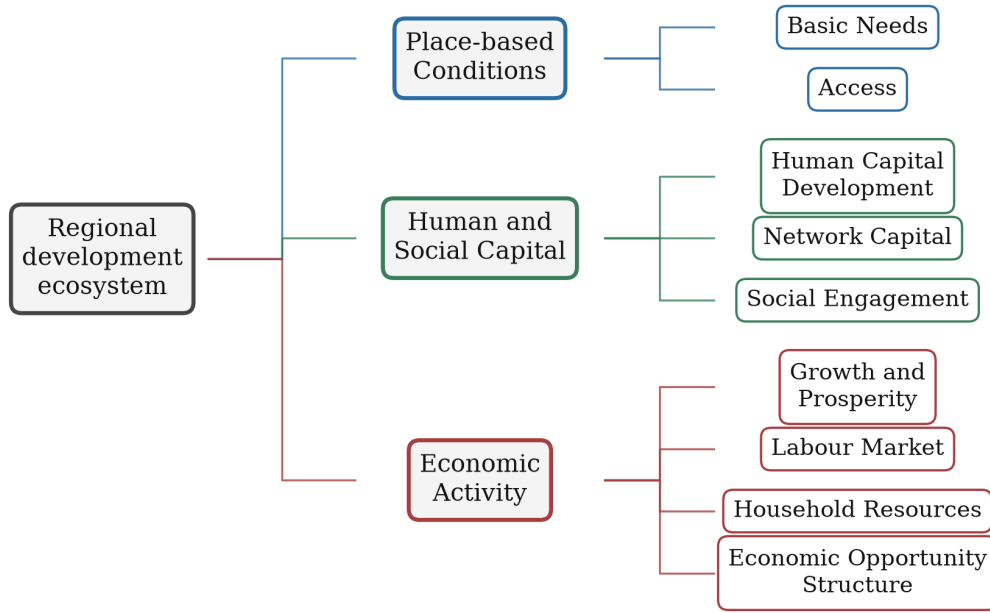


Figure 1. The three pillars and their sub-domains.

The three-pillar structure reflects consistent evidence that development requires simultaneous progress across territorial, social and economic dimensions, with specific interaction patterns between them. Physical infrastructure without social activation yields limited returns (Crescenzi and Rodríguez-Pose, 2012b). Human capital without economic opportunity produces brain drain, as documented across Eastern Europe (Atoyan et al., 2016; European Commission, 2023), and it also leads to under-utilisation of the resources that formed the talent. The returns to cohesion spending depend on the quality of government in the receiving region, and beyond a threshold of expenditure better government does more for growth than further money (Rodríguez-Pose and Garcilazo, 2015). The complementarities between dimensions appear stronger than the substitution effects. A deficit in any one of them can therefore become a binding constraint on the others, in the sense of Hausmann, Rodrik and Velasco's (2008) growth diagnostics, where the task is to find the one constraint whose relaxation would do most.

The three are not mutually exclusive boxes, and some indicators could be argued into more than one, with institutional quality and household security the clearest cases. Where a construct could sit in more than one pillar, I assign it by its primary role in the mechanism map. A territorial or institutional foundation goes to Place, a capability or connection that activates that foundation goes to People, and a current outcome or a source of future productive potential goes to Economy. On that rule, institutional quality is a Place foundation, household security an economic outcome, and knowledge infrastructure a Place asset that the economy draws on. The three pillars are the smallest grouping that keeps territory, people and economy analytically visible while letting the mechanisms between them be named. I justify the partition by what it yields, which is a ladder with a stable ordering and a usable mechanism map, and for that the domains need not be separable in the data.

3.2 Place-based Conditions: the territorial foundation

Place-based Conditions are the physical, infrastructural and institutional environment that creates the basic possibility space for development. Barca (2009) treats territory as a persistent construction of interdependencies, something more than geography. Iammarino et al. (2019) show place-specific factors creating spatial development traps, which regions can fall into and then find hard to get out of. The pillar integrates formal and informal institutions, following Rodríguez-Pose (2013) on the institutional foundations of regional development. Territory provides necessary foundations, but these require activation through social and economic mechanisms.

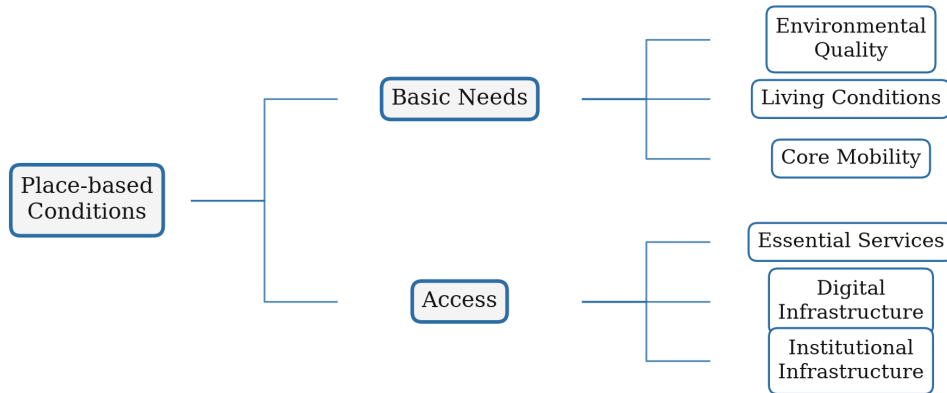


Figure 2. Place-based Conditions: sub-domains and components.

Environmental quality, living conditions and access to services are gateway requirements without which other development processes cannot function. Regions below basic thresholds show constrained development regardless of other investment (Di Cataldo and Rodríguez-Pose, 2017). Environmental quality affects productivity through health (Hanna and Oliva, 2015; Dechezleprêtre, Rivers and Stadler, 2019), while access to healthcare, education and digital infrastructure shapes the range of opportunities, with core-periphery dynamics reinforcing spatial inequality (Tranos and Nijkamp, 2013).

Institutional infrastructure is the organisational capacity for governance and service delivery that determines how other investments translate into outcomes. The returns to public investment are strongly moderated by the quality of regional government (Rodríguez-Pose and Garcilazo, 2015). A strong bivariate association, on the order of 0.5 to 0.6, holds between the European Quality of Government Index and regional development, which the authors read as mutual reinforcement between governance and development and not as a one-way effect (Charron, Dijkstra and Lapuente, 2014). The return on a region's knowledge base also depends on relatedness, since a region diversifies most readily into activities close to what it already does (Balland et al., 2019). Institutional effectiveness therefore multiplies, or holds back, the effect of every other investment a region receives.

3.3 Human and Social Capital: the activation dimension

Human and Social Capital are the capabilities and connections that activate territorial potential and mediate its translation into economic outcomes. The pillar integrates Becker's (1964) human capital with Coleman's (1988) social capital as a relational structure between those who inhabit a place. Civic traditions affect institutional performance and economic outcomes (Putnam, 1993),

while social connections are among the strongest predictors of upward mobility (Chetty et al., 2022). Individual capabilities function most effectively through social mechanisms, and for this reason I treat the two together.

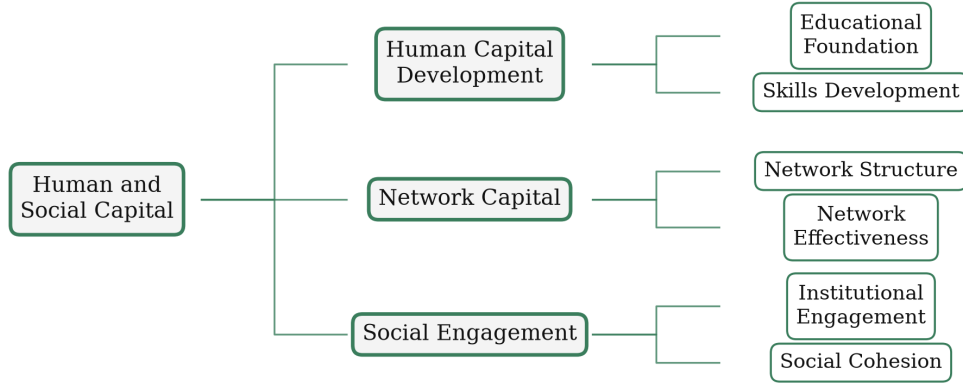


Figure 3. *Human and Social Capital: sub-domains and components.*

The pillar spans the stock of skills, the architecture of connections, and the patterns of civic participation and trust. Cognitive skills matter more than years of schooling for growth (Hanushek and Woessmann, 2008). Regional human capital explains a substantial share of development differences (Gennaioli et al., 2013). Network position shapes outcomes, with weak ties enabling the discovery of opportunities and brokerage yielding advantage (Granovetter, 1973; Burt, 2004). Institutional trust and civic engagement enable the collective action on which effective governance depends (Putnam, 1993). Together, the capability stock, the network structure and the engagement patterns determine how effectively a region converts potential into outcomes.

3.4 Economic Activity: outcomes and future potential

Economic Activity captures both current performance and the structural characteristics that determine future potential, moving beyond GDP to multidimensional prosperity. The case for measures beyond production, including distribution and sustainability, goes back to Stiglitz, Sen and Fitoussi (2009). Inequality affects the duration of growth more than its level (Berg and Ostry, 2017), and household vulnerability persists alongside aggregate prosperity (OECD, 2020). For these reasons, economic measurement must capture generative capacity and distributional outcomes alongside aggregate performance.

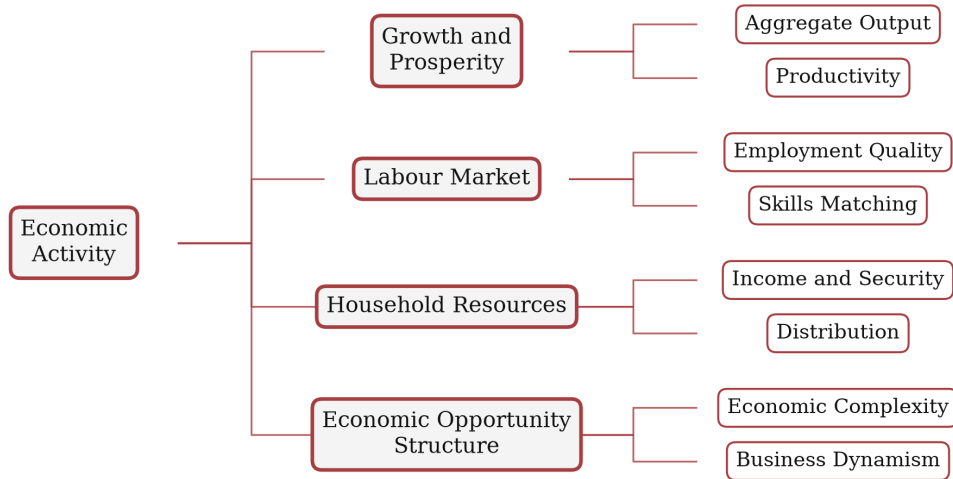


Figure 4. *Economic Activity: sub-domains and components.*

The pillar spans the sophistication of the productive structure, the quality of the labour market, and the security of household resources. Economic complexity predicts growth better than traditional indicators (Hidalgo and Hausmann, 2009; Hausmann et al., 2014), and diversification depends on existing capabilities (Balland et al., 2019). Household prospects are shaped by the quality of the labour market as well as by the level of employment. Household income and security diverge spatially through sorting, with neighbourhood conditions affecting long-run outcomes (Chetty and Hendren, 2018), and none of this is visible in aggregate output.

3.5 Ecosystem integration: how the pillars interact

The framework’s thesis is that regional development is a coupled, dynamic system whose structure becomes visible only under stress. While the system rests its parts move together, so that it looks one-dimensional (a single ‘development’ factor), and the structure appears when a shock pulls those parts apart at different rates. I use the word ecosystem for this, and the empirical companion tests it as a hypothesis. In calm conditions the pillars should collapse towards a single general factor and should not resolve into three separate ones, whereas under a shock the coupling should loosen selectively, in some links and not in others.

The interaction runs through three types of mechanism. In enabling, territorial conditions create the possibility of capability and network formation. In mediating, human and social capital translate territorial potential into economic outcomes, and in feedback, economic outcomes reinforce or erode the foundation. Each has a named precedent in the piecemeal literature of Section 2 (Rodríguez-Pose and Ketterer, 2020; Muringani et al., 2021; Cortinovis et al., 2017; Charron and Rothstein, 2018), which the framework draws together and does not replace. If the pillars were only one underlying factor, with nothing specific to each, they could not come apart selectively under stress, so a selective decoupling would mark them as distinct. If they were independent, they would not move together so closely in calm times, so a pervasive correlation would mark them as coupled. The framework implies both at once, and neither alternative produces the two together. A common factor with a specific component in each pillar would also show both. It differs from a coupled system in one respect, which is that in a coupled system an imbalance between the pillars is corrected over time, which is the property the model companion estimates.

Interconnection is therefore a property of a coupled dynamic system, which would move as one in calm conditions and come apart under stress. Which parts come apart depends on where the shock enters. A shock that arrives through one pillar should displace that pillar from the other two, so that the covariance changes while the level does not. How far the displacement is then corrected should depend on how the region's loops are organised, since the loops are what pull a displaced pillar back towards the others. A shock that reaches all three pillars at once should move the level and leave the couplings as they were. I expect the economic pillar to be the one that separates, because the people-to-economy link is the fast, behaviourally mediated coupling between activation and outcome, and a demand shock acts on it directly. Place-based conditions, by contrast, are a slow-moving stock of physical and institutional endowments that a short shock cannot quickly rewrite. The empirical companion finds this pattern in the euro crisis, which entered southern Europe through the economy and pulled the economic pillar away from people and place. The other two returned, while the economy stayed displaced for a decade. The companion finds the contrast in the pandemic, which reached the regions through a different channel, moved the blocs little and separated nothing. The regions it hurt were not the regions the euro crisis had hurt, so vulnerability at any moment depends on the channel through which the shock arrives. Separation in this sense is an imbalance between a region's own pillars, which is a different measure from the correlation between pillars across regions, and the empirical companion reports both and shows how they fit together. On the annual evidence, the loosening of the people-to-economy correlation after 2019 is a slow drift that began with the recovery from the euro crisis.

The slow and fast structure is what the framework implies, and it comes from the literature from which the word ecosystem is taken. Holling (1973) separated the stability of a system from its resilience, meaning the disturbance it can absorb before it changes state, and Walker, Holling, Carpenter and Kinzig (2004) gave that idea the vocabulary of basins, thresholds and adaptive capacity that regional resilience later borrowed. Carpenter and Turner (2000) showed that ecosystems are organised by the interaction of slow variables, which set the state, and fast variables, which equilibrate around it. Scheffer et al. (2001) showed that a gradual change in a slow variable can shift a system into a different state that no fast disturbance could reach. In the framework, the slow variable is the level that the three pillars share, and the fast variables are the imbalances between them. An imbalance is corrected, since the couplings pull the displaced pillar back towards the others, whereas a shock that moves all three together is absorbed as a new level, because no coupling pulls against it. Territory is the most persistent of the three stocks in the model companion, though only slightly more so than people, and the clearly slow part of the system is the common level, which is set largely by the country. The model companion estimates this structure in the manner of Ives et al. (2003), who estimate a community matrix from multivariate time series and read the system's stability from its eigenvalues, so that the regional ecosystem is treated as a community of three members.

A reading at the level of the system adds something that a single composite index or a single pairwise study does not provide. The configurations it identifies are stable but able to shift, so the structure is dynamic, and given how much pairwise variation the literature documents across Europe's regions a permanent classification would in any case be unlikely to hold.

The framework states these mechanisms as a map of directed pathways between pillars. The matrix below is the testable set for the companion papers. Each cell names a pathway and its precedent, and the framework's commitments are these pathways, more than the pillars themselves.

Pathway	Mechanism	What it says	Precedent
Place to People	enabling	infrastructure and institutions enable network formation and civic engagement	Tranos and Nijkamp 2013; Charron and Rothstein 2018
Place to Economy	enabling, gateway	basic conditions and government quality gate the returns to investment	Di Cataldo and Rodríguez-Pose 2017; Rodríguez-Pose and Garcilazo 2015
People to Economy	mediating	human and social capital raises economic connectedness, which mediates access to economic mobility, and the return to R&D depends on local human capital	Chetty et al. 2022; Crescenzi and Rodríguez-Pose 2012a
People to Place	feedback	civic capacity and trust sustain institutional quality	Putnam 1993
Economy to Place	feedback	the tax base funds the territorial foundation	this paper
Economy to People	feedback	high-productivity activity attracts and retains skills, and income funds capability formation	Fratesi and Percoco 2014, selective migration

Economy to Place, the funding of the territorial foundation from the tax base, is the one pathway I propose without a regional precedent. Specifying the mechanisms as directed pathways, where a composite index has only correlation, separates the framework from such an index. It also lets the framework generate standing configurations without further assumptions. The feedback pathways close loops, Economy to Place to People to Economy, so a configuration becomes self-reinforcing. A region whose enabling pathways are weak cannot turn investment into capability, and it is slow to correct an imbalance between its pillars. By contrast, a region whose loops are intact corrects such an imbalance quickly and compounds its advantages. The clubs and traps that the regional literature has long described are, in this framework, the standing solutions of this pathway structure. As Section 5.2 sets out, the level around which each region’s loops run is set predominantly by its country.

Section 4: Propositions and data

The framework is built to be tested, and the empirical companion evaluates it against European NUTS 2 data. It uses a wide cross-section of 294 regions in 2017 to 2019, which observes all three pillars at once, and an annual panel from 2008 to 2023, which brings both the euro crisis and the pandemic into view. The framework implies the following five propositions, and they define this test:

- That regional development is strongly and spatially structured, and is not a scatter of independent indicators
- That in calm conditions the three pillars move together and a single general factor fits the indicators, so that the pillars organise the indicators without being three statistically separable dimensions
- That regions sort into a ladder of a small number of tiers with a stable ordering
- That a shock which enters through one pillar separates that pillar from the others, with the separation corrected to a degree that depends on the region's loops, whereas a shock that reaches all three pillars moves the level
- That the level a region settles at is set predominantly by its country, while the imbalance between pillars varies by region

These five are what the framework implies, and the companions examine them against the data, with what they find set out in Section 5.3.

The data on which these propositions can be tested set the limits of what any test can show. Observing all three pillars at once across Europe requires combining Eurostat regional statistics with survey-based measures of trust, participation and belonging from the European Social Survey. These must be joined to the European Quality of Government Index and to satellite-derived environmental data, and all of them harmonised across three NUTS vintages, since regional boundaries changed in 2013, 2016 and 2021. The survey sources cover fewer regions than the registers and at longer intervals, so the social side of the framework is measured more thinly than the economic side. Furthermore, the multivariate methods that can treat the three pillars as one system require a single complete matrix of indicators. Missing values must therefore be imputed, and the indicator set is fixed in advance and cannot be chosen region by region. The people-side indicators also measure social conditions and not how people feel, so a loosening between people and economy is a loosening between measured conditions, and it should not be read as a change in subjective wellbeing. None of these is a reason not to attempt the test, but each shapes how its results should be read, and the companion sets them out in full.

Section 5: Implications and the road to demonstration

5.1 What the framework changes about regional policy

Understanding regions as ecosystems shifts development policy from optimising individual factors to managing the configuration of a system. Diagnosis changes from a needs assessment of separate domains to an assessment of where a region sits in the configuration of all three pillars. Intervention changes from transferable best practice to context-specific action on the binding constraint of a given region. Coordination becomes a requirement, since the separate operation of the ERDF, ESF+ and Cohesion Fund works against the interdependencies the framework identifies. Evaluation shifts from output metrics towards indicators of system health, including the strength of the couplings between pillars. In my view, the framework's policy value is diagnostic, in that it points to which dimension is likely to be binding for a given configuration of the three pillars, instead of prescribing the same instrument everywhere. It does not yet give a rule that maps each type of region to its binding pillar. However, it changes the question a diagnosis asks, from how much of each input a region lacks to which coupling is failing to turn those inputs into outcomes.

5.2 The typology as clubs and traps

A coupled system with self-reinforcing loops should settle regions into a small number of stable configurations, where a system without such loops would spread them evenly along a single scale. This connects the framework to an established line of regional economics, since those stable configurations are the development clubs of Iammarino, Rodríguez-Pose and Storper (2019), where the challenge at each tier is qualitatively different and is not a further step along one convergence path. The development trap of Diemer et al. (2022) is a related but separate condition. It records a region whose growth has stalled against its own past and against its peers, and the empirical companion finds that it bears no relation to a region's tier, so a low level and a stalled trajectory should be kept apart. I use the word basin for the level a region settles at, and the model companion gives it a definite meaning. That level is pulled predominantly by the region's country, in the model by 87 to 98 per cent of the twenty-five-year pull, so the basin is the national one, whereas the loop that sets how fast a region returns to it after an imbalance between its pillars is regional. The companion finds that loop running at different speeds and in different directions across Europe, slowest in the Mediterranean. This is the content of the fifth proposition, in which the level a region settles at is set predominantly by its country, the imbalances between pillars vary by region, and cohesion money is delivered at the regional scale.

This changes the policy problem, because the apparent single ladder involves two different tasks. Moving a region's level means moving the national system it belongs to. Incremental regional funding does not do that unless it reaches the binding constraint, whereas correcting a region's imbalance is a regional task. The framework is useful here as a diagnostic, since it matches the instrument to the failing coupling and does not prescribe convergence everywhere. The stakes run heaviest at the bottom of the ladder, since the companion finds that anti-establishment voting within countries follows a region's tier, which is the geography the discontent literature has tied to long-term decline (Rodríguez-Pose, 2018; Rodríguez-Pose, Dijkstra and Poelman, 2024).

Two regions, both drawn from the companions' estimates and both projected by the model paper to remain below Europe's 2008 bottom-quarter line in 2048, make the framework concrete. Calabria stood 1.4 standard deviations below the European mean in 2008, nineteenth from the bottom of the 210 regions the model follows. The euro crisis took its economy down and left its people and place where they were. By 2023 it stood seventh from the bottom, two standard deviations below Europe, having spent thirteen of fourteen years in the Diemer et al. (2022) trap. Its ecosystem is the Mediterranean one, in which the economy carries the level and reverts slowly (annual persistence 0.97), people lead the economy, and about half of an economic shock is still there after twenty-five years. It received cohesion money at about a third of a point of GDP above the European average. However, its people stock sits so far below the European mean that, at the absorptive gradient the causal evidence gives, it absorbs nothing, and the model projects it further down by 2048 under maintained conditions.

Východné Slovensko started lower, 1.7 standard deviations below Europe and thirteenth from the bottom, and is now sixteenth. Its ecosystem is the Eastern one, in which the economy corrects faster (persistence 0.95) and leads people, so that about two thirds of an economic shock is made up within twenty-five years. The country's level is also rising, so the model carries the region upward by 2048. It does so even though Východné Slovensko, too, absorbs nothing at its people score and has spent five of fourteen years in the trap. The two regions therefore share a tier, a money instrument and an absorption floor, and yet they are heading in opposite directions, because they differ in the loop each belongs to and in the national basin each is pulled towards. These are the two things the framework says should differ, and the two companions measure them.

5.3 What the companions find

The companions bear out the five propositions of Section 4, the first as stated, the second in its qualified form, the third as a ladder, the fourth with the euro crisis as the separating shock, and the fifth in both companions. The pathways fare differently, since from correlations over one year the empirical companion identifies only one of them, from economy to people within countries, and the model companion estimates all six as dynamic associations, not causes, small from one year to the next but compounding over decades. A version of that model without the six links fits worse by more than eighty log-posterior units. Economy to Place, the one pathway proposed here without a regional precedent, is the strongest link into place, whereas the effect of people on place is not distinguishable from zero. The loop between people and economy runs in different directions in different parts of Europe, with people leading in the South and in the struggling tier, the economy leading in the East and in the Continental and Nordic regions, and no feedback from the economy to people in the struggling tier. Selective migration, the precedent given above for Economy to People, is not the mechanism of the Eastern direction. The matrix therefore holds as a map of where the links run, whereas their direction differs by region and their causal reading remains open.

5.4 From description to dynamics

The present paper sets out the framework and the companion measures it, but neither can model the forces that hold a region at its level or return it after an imbalance. That is the task of the third paper, which estimates the dynamics as a linear state-space ecosystem model, in the form ecologists use to estimate a community matrix from time series (Ives et al., 2003), fitted to 210 regions over 2000 to 2023 with national conditions and cohesion payments as inputs. It asks how much of its state each pillar keeps from one year to the next, how much it passes to the others, what pulls the whole towards a level, and how far cohesion money can move any of it. This connects the framework to the established economics of club convergence and development traps, and also to the ecology of slow and fast variables set out in Section 3.5. In essence, the framework lays out the terrain in a form that an empirical companion can measure, and that measurement then sets up a modelling paper to estimate the dynamics and run scenarios.

Conclusion

In this paper I have proposed an ecosystem framework that organises regional development around three interacting pillars and specifies the enabling, mediating and feedback mechanisms through which they act on one another. A substantial literature already establishes that the dimensions of regional development interact, pair by pair. A parallel measurement literature already describes regions on several dimensions at once, so I make no claim of discovery here. The paper adds a single organisation for those scattered findings, conceptually specified and built to be tested, and the empirical companion then carries out the test.

The three pillars organise the evidence, and they are not three statistically separable dimensions. They are useful for what they make visible, which is a ladder of regional configurations with a stable ordering, a layer of cross-cutting syndromes and a structurally specific response to stress. Each syndrome is a set of indicators from different pillars that move together across regions and appear as a community in the indicator network. The interconnection the framework asserts is specific and can be tested, since it is the conjunction of strong coupling in normal times with selective decoupling

when a shock enters through one pillar, and neither a single underlying factor with stable loadings nor a set of independent parts can produce it. The empirical companion finds that conjunction in the euro crisis, which pulled the economic pillar away from people and place across southern Europe. It finds the contrast in the pandemic, which reached the regions through a different channel and separated nothing.

In terms of the regional clubs and development traps of the existing literature, the typology the framework implies is a set of stable configurations into which regions settle. The model companion finds that the basin a region settles in is its country's, and that the regional element is the speed at which the region's own loops return it there after an imbalance. This links the conceptual paper to the empirical companion that tests it, and to the state-space model that estimates what holds a region at its level and how fast it corrects an imbalance. Taken together, the three papers do not rest on a single decisive finding. Their aim is an understanding of regional development as an interconnected system that can be defended, and that brings together a literature which has so far addressed that system only in parts.

References

- Annoni, P. and Bolsi, P. (2020). The regional dimension of social progress in Europe: presenting the new EU Social Progress Index. JRC Working Paper, European Commission.
- Annoni, P. and Dijkstra, L. (2019). The EU Regional Competitiveness Index 2019. Regional and Urban Policy Working Papers. Luxembourg: Publications Office of the European Union.
- Antonakakis, N. and Collins, A. (2014). The impact of fiscal austerity on suicide: on the empirics of a modern Greek tragedy. *Social Science and Medicine*, 112, 39 to 50.
- Atoyan, R., Christiansen, L. E., Dizioli, A., Ebeke, C., Ilahi, N., Ilyina, A., Mehrez, G., Qu, H., Raei, F., Rhee, A. and Zakharova, D. (2016). Emigration and its economic impact on Eastern Europe. IMF Staff Discussion Note SDN/16/07. Washington, DC: International Monetary Fund.
- Baarck, J., Balahur-Dobrescu, A., Cassio, L. G., d'Hombres, B., Pasztor, Z. and Tintori, G. (2021). Loneliness in the EU: insights from surveys and online media data. JRC Science for Policy Report, EUR 30765 EN. Luxembourg: Publications Office of the European Union.
- Balland, P.-A., Boschma, R., Crespo, J. and Rigby, D. L. (2019). Smart specialization policy in the European Union: relatedness, knowledge complexity and regional diversification. *Regional Studies*, 53(9), 1252 to 1268.
- Barca, F. (2009). An Agenda for a Reformed Cohesion Policy. Independent Report, European Commission.
- Becker, G. S. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. National Bureau of Economic Research and Columbia University Press.
- Becker, S. O., Egger, P. H. and von Ehrlich, M. (2010). Going NUTS: The effect of EU Structural Funds on regional performance. *Journal of Public Economics*, 94(9 to 10), 578 to 590.
- Becker, S. O., Egger, P. H. and von Ehrlich, M. (2013). Absorptive capacity and the growth and investment effects of regional transfers: A regression discontinuity design with heterogeneous treatment effects. *American Economic Journal: Economic Policy*, 5(4), 29 to 77.

- Becker, S. O., Egger, P. H. and von Ehrlich, M. (2018). Effects of EU regional policy: 1989 to 2013. *Regional Science and Urban Economics*, 69, 143 to 152.
- Berg, A. and Ostry, J. D. (2017). Inequality and unsustainable growth: two sides of the same coin? *IMF Economic Review*, 65(4), 792 to 815.
- Boschma, R. (2015). Towards an evolutionary perspective on regional resilience. *Regional Studies*, 49(5), 733 to 751.
- Burt, R. S. (2004). Structural holes and good ideas. *American Journal of Sociology*, 110(2), 349 to 399.
- Camagni, R. and Capello, R. (2013). Regional competitiveness and territorial capital: a conceptual approach and empirical evidence from the European Union. *Regional Studies*, 47(9), 1383 to 1402.
- Carpenter, S. R. and Turner, M. G. (2000). Hares and tortoises: Interactions of fast and slow variables in ecosystems. *Ecosystems*, 3(6), 495 to 497.
- Case, A. and Deaton, A. (2015). Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century. *Proceedings of the National Academy of Sciences*, 112(49), 15078 to 15083.
- Case, A. and Deaton, A. (2017). Mortality and morbidity in the 21st century. *Brookings Papers on Economic Activity*, Spring, 397 to 476.
- Cerqua, A. and Pellegrini, G. (2018). Are we spending too much to grow? The case of Structural Funds. *Journal of Regional Science*, 58(3), 535 to 563.
- Charron, N., Dijkstra, L. and Lapuente, V. (2014). Regional governance matters: quality of government within European Union member states. *Regional Studies*, 48(1), 68 to 90.
- Charron, N. and Rothstein, B. (2018). Regions of trust and distrust: how good institutions can foster social cohesion. In U. Bernitz, M. Mårtensson, L. Oxelheim and T. Persson (eds), *Bridging the Prosperity Gap in the EU: The Social Challenge Ahead*. Cheltenham: Edward Elgar, 220 to 242.
- Chetty, R. and Hendren, N. (2018). The impacts of neighborhoods on intergenerational mobility I: childhood exposure effects. *Quarterly Journal of Economics*, 133(3), 1107 to 1162.
- Chetty, R., Jackson, M. O., Kuchler, T., Stroebel, J. et al. (2022). Social capital I: measurement and associations with economic mobility. *Nature*, 608, 108 to 121.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94 (Supplement), S95 to S120.
- Conway, A. (2020). Wellbeing and Macroeconomics: a SAGE approach. Master's thesis, Sciences Po Paris.
- Conway, A. (in preparation, a). Two Crises, One Structure: Coupling and Scale in European Regional Ecosystems. [verify title with author]
- Conway, A. (in preparation, b). Slow Ecosystems: Regional Development, National Systems and the Limits of Cohesion Policy in Europe, 2000 to 2023.
- Cooke, P. (2001). Regional innovation systems, clusters, and the knowledge economy. *Industrial and Corporate Change*, 10(4), 945 to 974.

- Cortinovis, N., Xiao, J., Boschma, R. and Van Oort, F. G. (2017). Quality of government and social capital as drivers of regional diversification in Europe. *Journal of Economic Geography*, 17(6), 1179 to 1208.
- Crescenzi, R. and Giua, M. (2020). One or many Cohesion Policies of the European Union? On the differential economic impacts of Cohesion Policy across member states. *Regional Studies*, 54(1), 10 to 20.
- Crescenzi, R. and Rodríguez-Pose, A. (2012a). An ‘integrated’ framework for the comparative analysis of the territorial innovation dynamics of developed and emerging countries. *Journal of Economic Surveys*, 26(3), 517 to 533.
- Crescenzi, R. and Rodríguez-Pose, A. (2012b). Infrastructure and regional growth in the European Union. *Papers in Regional Science*, 91(3), 487 to 513.
- Crescenzi, R., Rodríguez-Pose, A. and Storper, M. (2007). The territorial dynamics of innovation: a Europe-United States comparative analysis. *Journal of Economic Geography*, 7(6), 673 to 709.
- Dechezleprêtre, A., Rivers, N. and Stadler, B. (2019). The economic cost of air pollution: evidence from Europe. OECD Economics Department Working Papers, No. 1584. Paris: OECD Publishing.
- Di Cataldo, M. and Rodríguez-Pose, A. (2017). What drives employment growth and social inclusion in the regions of the European Union? *Regional Studies*, 51(12), 1840 to 1859.
- Diemer, A., Iammarino, S., Rodríguez-Pose, A. and Storper, M. (2022). The regional development trap in Europe. *Economic Geography*, 98(5), 487 to 509.
- Dijkstra, L., Poelman, H. and Rodríguez-Pose, A. (2020). The geography of EU discontent. *Regional Studies*, 54(6), 737 to 753.
- Egri, Z. and Lengyel, I. (2023). Convergence and catch-up of the region types in the Central and Eastern European countries. *Applied Spatial Analysis and Policy*, 17, 393 to 415.
- European Commission (2021). Available budget of Cohesion Policy 2021 to 2027. Directorate-General for Regional and Urban Policy.
- European Commission (2022). Italy 2021 to 2027 partnership agreement. European Social Fund Plus.
- European Commission (2023). Harnessing talent in Europe’s regions. COM(2023) 32 final, 17 January 2023. Brussels: European Commission.
- European Court of Auditors (2024). 2023 EU audit in brief: introduction to the 2023 annual reports of the European Court of Auditors. Luxembourg: European Court of Auditors.
- European Parliament (2024). Report on cohesion policy 2014 to 2020: implementation and outcomes in the member states. Committee on Regional Development, A9-0049/2024.
- European Union (2021). Regulation (EU) 2021/1060 of the European Parliament and of the Council of 24 June 2021 laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund and other funds. *Official Journal of the European Union*, L 231, 30 June 2021, 159 to 706.
- Eurostat (2021). R&D expenditure in the EU at 2.3% of GDP in 2020. Eurostat news release.
- Eurostat (2024). EU spent 381.4 billion euro on R&D in 2023. Eurostat news release, 11 December 2024.

- Eurostat (2026). Household composition statistics. Statistics Explained. Luxembourg: Eurostat.
- Fanti, L., Pereira, M. C. and Virgillito, M. E. (2023). The North-South divide: sources of divergence, policies for convergence. *Journal of Policy Modeling*, 45(2), 405 to 429.
- Fingleton, B., Garretsen, H. and Martin, R. (2012). Recessionary shocks and regional employment: Evidence on the resilience of U.K. regions. *Journal of Regional Science*, 52(1), 109 to 133.
- Fratesi, U. and Percoco, M. (2014). Selective migration, regional growth and convergence: Evidence from Italy. *Regional Studies*, 48(10), 1650 to 1668.
- Fratesi, U. and Perucca, G. (2018). Territorial capital and the resilience of European regions. *Annals of Regional Science*, 60(2), 241 to 264.
- Fratesi, U. and Rodríguez-Pose, A. (2016). The crisis and regional employment in Europe: What role for sheltered economies? *Cambridge Journal of Regions, Economy and Society*, 9(1), 33 to 57.
- Gennaioli, N., La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2013). Human capital and regional development. *Quarterly Journal of Economics*, 128(1), 105 to 164.
- Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360 to 1380.
- Hanna, R. and Oliva, P. (2015). The effect of pollution on labor supply: evidence from a natural experiment in Mexico City. *Journal of Public Economics*, 122, 68 to 79.
- Hanushek, E. A. and Woessmann, L. (2008). The role of cognitive skills in economic development. *Journal of Economic Literature*, 46(3), 607 to 668.
- Hausmann, R., Hidalgo, C. A., Bustos, S., Coscia, M., Simoes, A. and Yildirim, M. A. (2014). *The Atlas of Economic Complexity: Mapping Paths to Prosperity*. Cambridge, MA: MIT Press.
- Hausmann, R., Rodrik, D. and Velasco, A. (2008). Growth diagnostics. In N. Serra and J. E. Stiglitz (eds), *The Washington Consensus Reconsidered: Towards a New Global Governance*. Oxford: Oxford University Press, 324 to 355.
- Hidalgo, C. A. and Hausmann, R. (2009). The building blocks of economic complexity. *Proceedings of the National Academy of Sciences*, 106(26), 10570 to 10575.
- Hidalgo, C. A., Klinger, B., Barabási, A.-L. and Hausmann, R. (2007). The product space conditions the development of nations. *Science*, 317(5837), 482 to 487.
- Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4, 1 to 23.
- Iacobucci, D. (2014). Designing and implementing a smart specialisation strategy at regional level: some open questions. *Scienze Regionali*, 13(1), 107 to 126.
- Iammarino, S., Rodríguez-Pose, A. and Storper, M. (2019). Regional inequality in Europe: evidence, theory and policy implications. *Journal of Economic Geography*, 19(2), 273 to 298.
- IMF (2022). *Regional Disparities in Europe*. IMF Working Paper WP/22/198 (Balakrishnan, Ebeke, Firat, Malacrino and Rabier).
- ISTAT (2025). *Conti economici territoriali, anni 2021 to 2023*. Statistical release, 28 January 2025. Rome: Istituto Nazionale di Statistica.

- Ives, A. R., Dennis, B., Cottingham, K. L. and Carpenter, S. R. (2003). Estimating community stability and ecological interactions from time-series data. *Ecological Monographs*, 73(2), 301 to 330.
- Jaakkola, E. (2020). Designing conceptual articles: four approaches. *AMS Review*, 10, 18 to 26.
- Krugman, P. (1991). Increasing returns and economic geography. *Journal of Political Economy*, 99(3), 483 to 499.
- Lima de Miranda, K. and Snower, D. J. (2020). Recoupling economic and social prosperity. *Global Perspectives*, 1(1), 11867.
- MacKinnon, D., Kempton, L., O'Brien, P., Ormerod, E., Pike, A. and Tomaney, J. (2022). Reframing urban and regional 'development' for 'left behind' places. *Cambridge Journal of Regions, Economy and Society*, 15(1), 39 to 56.
- Martin, R. (2012). Regional economic resilience, hysteresis and recessionary shocks. *Journal of Economic Geography*, 12(1), 1 to 32.
- Martin, R. and Sunley, P. (2015). On the notion of regional economic resilience: conceptualization and explanation. *Journal of Economic Geography*, 15(1), 1 to 42.
- Mohl, P. and Hagen, T. (2010). Do EU structural funds promote regional growth? New evidence from various panel data approaches. *Regional Science and Urban Economics*, 40(5), 353 to 365.
- Muringani, J., Fitjar, R. D. and Rodríguez-Pose, A. (2021). Social capital and economic growth in the regions of Europe. *Environment and Planning A*, 53(6), 1412 to 1434.
- Neffke, F., Henning, M. and Boschma, R. (2011). How do regions diversify over time? Industry relatedness and the development of new growth paths in regions. *Economic Geography*, 87(3), 237 to 265.
- OECD (2020). *How's Life? 2020: Measuring Well-being*. OECD Publishing.
- Papamichail, G., Rosiello, A. and Wield, D. (2023). Addressing public policy implementation challenges in lagging regions through the analytical lens of smart specialisation. *Journal of the Knowledge Economy*, 14, 356 to 381.
- Pellegrini, G., Terribile, F., Tarola, O., Muccigrosso, T. and Busillo, F. (2013). Measuring the effects of European Regional Policy on economic growth: A regression discontinuity approach. *Papers in Regional Science*, 92(1), 217 to 233.
- Pike, A., Béal, V., Cauchi-Duval, N., Franklin, R., Kinossian, N., Lang, T., Leibert, T., MacKinnon, D., Rousseau, M., Royer, J., Servillo, L., Tomaney, J. and Velthuis, S. (2024). 'Left behind places': a geographical etymology. *Regional Studies*, 58(6), 1167 to 1179.
- Prota, F., Viesti, G. and Bux, M. (2020). The contribution of European Cohesion Policy to public investment, in F. Cerniglia and F. Saraceno (eds.), *A European Public Investment Outlook*. Open Book Publishers, chapter 10, 175 to 193.
- Putnam, R. D. (1993). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press.
- Putnam, R. D. (2015). *Our Kids: The American Dream in Crisis*. Simon and Schuster.
- Rodríguez-Pose, A. (2013). Do institutions matter for regional development? *Regional Studies*, 47(7), 1034 to 1047.

- Rodríguez-Pose, A. (2018). The revenge of the places that don't matter (and what to do about it). *Cambridge Journal of Regions, Economy and Society*, 11(1), 189 to 209.
- Rodríguez-Pose, A. and Crescenzi, R. (2008). Research and development, spillovers, innovation systems, and the genesis of regional growth in Europe. *Regional Studies*, 42(1), 51 to 67.
- Rodríguez-Pose, A. and Garcilazo, E. (2015). Quality of government and the returns of investment: examining the impact of cohesion expenditure in European regions. *Regional Studies*, 49(8), 1274 to 1290.
- Rodríguez-Pose, A. and Ketterer, T. (2020). Institutional change and the development of lagging regions in Europe. *Regional Studies*, 54(7), 974 to 986.
- Rodríguez-Pose, A., Dijkstra, L. and Poelman, H. (2024). The geography of EU discontent and the regional development trap. *Economic Geography*, 100(3), 213 to 245.
- Scheffer, M., Carpenter, S., Foley, J. A., Folke, C. and Walker, B. (2001). Catastrophic shifts in ecosystems. *Nature*, 413(6856), 591 to 596.
- Sen, A. (1999). *Development as Freedom*. Oxford University Press.
- Stiglitz, J. E., Sen, A. and Fitoussi, J.-P. (2009). Report by the Commission on the Measurement of Economic Performance and Social Progress.
- Storper, M. (2013). *Keys to the City: How Economics, Institutions, Social Interaction, and Politics Shape Development*. Princeton, NJ: Princeton University Press.
- Tranos, E. and Nijkamp, P. (2013). The death of distance revisited: cyberplace, physical and relational proximities. *Journal of Regional Science*, 53(5), 855 to 873.
- Veneri, P. and Murin, F. (2019). Where are the highest living standards? Measuring well-being and inclusiveness in OECD regions. *Regional Studies*, 53(5), 657 to 666.
- Walker, B., Holling, C. S., Carpenter, S. R. and Kinzig, A. (2004). Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society*, 9(2), 5.