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KEYWORDS

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Using comprehensive provincial-level data from 2013 to 2019 on broadband coverage and hospital-based oncological procedures, we examine how improved internet access affects patients' decisions to seek treatment outside their region or province of residence.
We find that increased broadband availability significantly reduces patient mobility for cancer care, particularly for complex conditions with lower survival rates, such as pancreatic and lung cancer. The effect is more pronounced among younger patients and those residing in the South of Italy, where perceptions of local care quality are poorer.
By contrast, the impact is weaker among older patients and individuals traveling from Central Italy. Our findings suggest that enhanced digital connectivity lowers information frictions, enabling patients to better evaluate local healthcare options and thereby avoid some unnecessary cross-regional mobility.
This paper contributes to two strands of the literature: the role of information in healthcare markets and the broader effects of internet infrastructure on health-related decision-making.

Overall, the results underscore the importance of policies for digital inclusion in mitigating regional healthcare disparities and improving patient decision-making.

How digital divide and hospital quality misperception affect patients mobility *

Carla Guerriero† Rosella Levaggi‡ Paolo Li Donni§ Sara Moccia¶

Abstract

This paper investigates the effect of broadband internet diffusion on patient mobility in Italy's decentralized healthcare systems. Using comprehensive provincial-level data from 2013 to 2019 on broadband coverage and hospital-based oncological procedures, we consider how improved internet access affects patients' decisions to seek treatment outside their region or province of residence. We find that increased broadband availability significantly reduces patient mobility for cancer care, particularly for complex conditions with lower survival rates such pancreatic and lung cancer. The effect is more pronounced among younger patients and those residing in the South of Italy, where perceptions of local care quality are poorer. By contrast, the impact is weaker among older patients and individuals traveling from Central Italy. Our findings suggest that enhanced digital connectivity lowers information frictions, enabling patients to better evaluate local healthcare options and thereby avoiding some unnecessary cross-regional mobility. This paper contributes to two strands of the literature: on the role of information in healthcare markets and on the broader effects of internet infrastructure on health-related decision-making. Our results underscore the role of policies for digital inclusion in mitigating regional healthcare disparities and improving patient decision-making.

JEL classification: I18;I12;L86
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† University of Naples Federico II and CSEF. E-mail: `carla.guerriero@unina.it`.
‡ University of Brescia. E-mail: `rosella.levaggi@unibs.it`
§ University of Palermo. E-mail: `paolo.lidonni@unipa.it`
¶ University of Naples Federico II. Corresponding author. E-mail: `sara.moccia@unina.it`.

1 Introduction

Devolution is a feature of a number of European countries, including Austria, Denmark, Germany, Sweden, Italy and Spain (Adolph et al., 2012; Costa-Font and Perdikis, 2020). As a result, quality often varies between regions and cross-border shopping by patients is often a significant phenomenon. This is a major problem in countries such as Spain (Cantarero, 2006) and Italy. According to some recent estimates, about 1 million Italian patients travel yearly from the southern to the northern regions, which is tantamount to 5 billion euros shifted from South to North (GIMBE, 2025), and constitutes an important drain of resources from poor to rich regions (Berta et al., 2021; Carnazza et al., 2024).

Cross-border mobility involves significant costs. While medical care may be free at the point of use, patients defray the cost of travel and accommodation, and especially that associated with gathering information about potential care providers. Internet access has been essential in reducing both financial and informational barriers. The availability of online health resources has made it easier and less costly for patients to obtain relevant information diminishing information asymmetries between patients and providers (Amaral-Garcia et al., 2024). However, while information available online is vast in quantity, its quality and reliability varies widely, and users may find it hard to assess or interpret (Eysenbach et al., 2002). Nevertheless, digital tools have empowered an increasing number of individuals to engage more actively with their healthcare choices. Recent Eurostat data show that internet use for health-related information is widespread in Italy: 53% of Italians aged 16 to 74 search online for details about symptoms, treatments, and health providers [1]. Numerous studies indicate that a substantial proportion of Italians rely on the web to obtain information on health and wellness, reflecting a growing demand for accessible and transparent healthcare information. In the same vein, it has been found that 42% of Italians actively research health-related issues online, including conditions, prevention strategies, and healthcare services.[2]

In a healthcare system like Italy's, where patients can seek treatment across regional borders, the spread of broadband internet is expected to change how individuals search for information and choose providers, mainly by reducing the time and effort required to compare them. At the

[1] Source: Eurostat `https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20210406-1`.
[2] Source: Assidai `https://www.assidai.it/salute-il-42-cerca-informazioni-sul-web/`..

same time, online information may lead patients to realize that providers offer similar standards of care, particularly in oncology, where national protocols help ensure consistent treatment across regions, and so lower the perceived benefit of traveling for care, potentially acting as a deterrent to mobility.

In this paper we propose to investigate the influence of broadband access on patients' decisions to seek medical treatment outside the ordinary catchment area. Using a comprehensive dataset from 2013 to 2019, that includes detailed records of broadband coverage and penetration across Italy alongside all hospital oncological procedures, we analyze how access to broadband affects patient mobility.

We ask two main research questions: Are patients with better internet access more or less inclined to cross-border healthcare shopping? Does the proliferation of internet **allows to get a more precise perception of actual quality** of nearby healthcare services, and thus avoiding some unnecessary patient mobility?

The Italian context offers an ideal opportunity to study the effect of internet roll-out on patients' mobility. Inter-regional mobility for oncological treatments in Italy is considerably greater than in many other developed countries. Some 11.4% of cancer-related hospital admissions occur outside the patient's region of residence, and the phenomenon is particularly pronounced among patients from southern and central Italy, who often travel to northern regions seeking care (Torre et al., 2021). Provincial disparities in cancer survival are largely driven by differences in the availability and effectiveness of local screening programs, which significantly affect the timing of cancer detection. In areas where screening initiatives are delayed or less comprehensive, cancers are more frequently diagnosed at advanced stages, with a concomitant diminution of the chances of successful treatment outcomes (Balzano et al., 2023; Martini et al., 2022). Once a diagnosis is made, however the subsequent clinical management, including treatment protocols and care planning, follows a standardized nationwide approach. This uniformity is guaranteed by the guidelines of the Associazione Italiana di Oncologia Medica (AIOM), which are nationally recognized, regularly updated, and strictly enforced across all regions (AIOM, 2024).[3]

[3]The AIOM guidelines provide evidence-based recommendations covering all phases of cancer care—from prevention and diagnosis to treatment, follow-up, and palliative care. As part of Italy's Sistema Nazionale Linee Guida (SNLG), these protocols carry both clinical and legal authority, ensuring that patients across the country

The Italian context also provides a unique opportunity to study the intersection between digital infrastructure and healthcare behavior. The period analyzed coincides with major national investments in broadband connectivity, including the launch of the Italian Ultra-Broadband Strategy and the creation of Open Fiber in 2015. These efforts significantly accelerated the deployment of fiber-optic networks, particularly in underserved areas, offering an invaluable setting for exploring how improved internet access can ease information frictions and influence healthcare decisions (Digital Watch Observatory, 2021).

Based on our analysis of broadband coverage at the provincial level, we find that increased access reduces patients' mobility across provinces and regions for all four types of cancer considered: stomach, lung, breast, and pancreatic. The effect is particularly pronounced for cancers with lower five-year survival rates, where treatment is typically more complex, suggesting that better internet access may reduce the need to seek care outside the local area. We also find that the impact of broadband coverage is less pronounced among older patients (over 65) and for those resident in central Italy.

Our paper contributes to two strands of the literature. First, we examine the effect of increased information in healthcare markets, particularly where information asymmetry is a concern. Governments, in a number of countries including Italy, have data on official websites to help patients compare healthcare providers, including data on hospitals' quality. The evidence on the effect is still limited and mixed. In the U.S., show that the introduction of online report cards for coronary artery bypass graft (CABG) procedures led to increased hospital competition and improved health outcomes for Medicare patients (Chou et al., 2014). In the U.K.,providing information on hospital performance made patients more responsive to quality, resulting in a 3% decrease in mortality rates (Gaynor et al., 2016). Building on these studies, we provide novel evidence on the effect of internet access on patients mobility. Our findings suggest that greater internet access reduces mobility, even after controlling for waiting times and local service quality.

Second, we contribute to the literature on the impact of internet use and diffusion on the healthcare market. Our study adds to this strand of the literature by exploiting a nationwide program of internet upgrading and obtaining empirical evidence on the role of online information

receive consistent, high-quality oncological treatment regardless of geographic location.

and communication technology on patients' decision-making strategies (Amaral-Garcia et al., 2022)(Amaral-Garcia et al., 2024). Several studies confirm that online ratings and public report cards significantly shape patient choice of hospitals. For instance, in the United States, Li et al. (2021) show that physician review sites influence CABG surgeon selection substantially, whereas traditional report cards have a negligible effect. For Germany, Emmert et al. (2017) demonstrate that the design features of report cards, such as numerical displays affect hospital choice, particularly among better educated users. Large-scale analyses in Germany (Avdic et al., 2020) and Taiwan (Chen et al., 2022) find that patients are willing to travel for quality when it is clearly communicated, and that younger or more engaged users are more responsive to online sources. Similarly, Amaral-Garcia et al. (2022), using data from the United Kingdom, show that expanded broadband access led to increased elective care uptake, suggesting that online information can empower patients to influence treatment decisions. At the same time however, Amaral-Garcia et al. (2024) find that in England, greater internet access reduced vaccine uptake during the MMR-autism controversy, highlighting how patient behavior is shaped by the quality and framing of the information available online. Unlike prior studies on the influence of online information on elective procedures or vaccine hesitancy,**our paper provides the first evidence for Italy that expanded broadband reduces information frictions in a decentralized health system. Patients are able to verify whether their quality perceptions are in fact supported by quality indicators. A north-south divide seems to emerge: in the North broadband access reduces inter-regional hospital mobility for cancer care, particularly where treatment is more complex; on the contrary in the South where local healthcare quality is lower patients that have access to broadband get better information about this quality gap and patients mobility increases.**

The remainder of this paper is structured as follows: Section 2 reviews the most recent findings of the literature. Section 3 provides an overview of the Italian healthcare system. Section 4 summarizes the background of internet development in Italy. Section 5 sets out the data, the identification strategy while the empirical results are in Section 6. Section 7 concludes.

2 The literature

Mobility in Italy does always originate strictly from patients' choice: a considerable pull effect is exerted by excess capacity and budget constraints that is, some regions actively seek to attract patients (Fabbri and Robone, 2010) drawing them from poorer to richer regions (South to North) and, especially the most severe cases. More recent studies (Balia et al., 2017, 2020), have found that regional income, hospital capacity, organizational structure, performance and technology are the main determinants of inter regional mobility.

Berta et al. (2021) illustrate different patterns of patients' mobility: long distance traveling, which often originates from quality and border mobility which is instead most often driven by waiting time considerations. One question less debated is whether such mobility is justified by observing quality differences and if patients choices allow them to obtain better quality. Martini et al. (2022a) use the difference in regional institutional settings to show that patients' perceptions may be more important than true quality indicators and that quality is more important in more competitive settings.

Significantly greater mobility from southern and central Italy to the North for complex procedures such as pancreatic surgery is well documented, suggesting persistent inequalities in access to specialized care (Balzano et al., 2023). These patterns are consistent with the broader North–South divide in Italy's healthcare performance, documented by extensive evidence on institutional and financial disparities across regions (Atella et al., 2014), (Depalo, 2019), (Di Novi et al., 2019)). Yet patients' perceptions do not always reflect actual differences in care quality. Programs such as the Territorial Oncology Care (TOC) initiative in the Piacenza district show that providing cancer services closer to home can reduce the burden of travel and improve patient satisfaction, underscoring the potential of local service enhancement to curb unnecessary mobility (Cavanna et al., 2023).

The literature on the effect of patient mobility on care quality and the quality gap is not conclusive. The theoretical literature seems to indicate that if certain conditions are met mobility should increase quality and reduce the quality gap (Andritsos and Tang, 2014; Guccio et al., 2024; Brekke et al., 2014, 2015; Levaggi and Levaggi, 2024). However, this prediction is not always supported by the empirical evidence. Finally, some studies treat patient mobility itself as a measure of perceived quality: for example, Martini et al. (2014) use extra-regional patient mobility as a proxy for perceived hospital quality and examine how efficiency relates to key health outcomes such as mortality and readmissions Martini et al. (2014).

With the advent of the internet and the diffusion of data at hospital level the cost of acquiring information also depends on the manner in which it is acquired. Reliability and speed of the internet connections are certainly important factors in consumers' search choices because much of the information on the net is dispersed. High-speed internet connection enables patients access a variety of sources and aggregate information. The diffusion of internet thus permits less costly information acquisition, but it can have both positive and detrimental effects on the health care market.

As is suggested by Amaral-Garcia et al. (2024), internet access can lower information barriers and give patients access to an unprecedented wealth of information about the quality and in some cases the price of health care services (e.g. aesthetic surgery). Van Parys and Brown (2024) find that the diffusion of the broadband may have improved health outcomes by 3% for hip replacement among Medicare users.

Another element to consider is the quality of the information itself. Lega and Prenestini (2024a) use the difference in regional institutional setting to show that patients' perceptions may be more important than true quality indicators and that quality is more important in more competitive settings, (Carrieri et al., 2019) show that in Italy the spread of misinformation and social media drove vaccine hesitancy following a ruling handed down by the Court of Rimini in 2012 and lowering child immunization rates for all types of vaccines. However very little is known about the effect of the diffusion of internet and patients' choices as far as hospital admission is concerned.

3 The health care system in Italy

In Italy the primary source of funding for health care services is taxation, so that health care is essentially free at point of use. While each region must guarantee a minimum level of care (LEA, Livelli Essenziali di Assistenza) the devolution of powers gave rise to 21 regional systems responsible for health care provision, funding, organization, and delivery to guarantee the LEA (de Belvis et al., 2022; Martini et al., 2022a). For hospital care, providers compete in quality under a prospective payment-oriented system based on Diagnosis Related Groups (DRGs), but the heterogeneity of health care organization has created substantial jurisdictional differences in hospital capacity, technological endowment, income, and financing capacity. The differences in the the organization of primary and hospital care, inputs and outcome indicators, and waiting times are quite widespread ((Osservasalute, 2016; Francese and Romanelli, 2014)). As in many European healthcare systems, in Italy to some extent patients can choose their preferred provider and may also choose to be treated outside their home Region. Italian patients travel long distances (an average of 725km), a phenomenon that has no counterpart anywhere in Europe (Osservasalute, 2016; Francese and Romanelli, 2014). This is the result of both a push and pull effect. On one side, long waiting times may make people willing to pay for elective surgery outside their Region (about 22% in the North and 33% in the South, according to RBM-Censis (2019)). A pull effect is also at work; in order to contain costs and offset incentives to increase admissions, all Italian regions have some spending cap for hospitals, but it does not apply to extra-regional patients, who are reimbursed by the region of origin according to national tariff rates (Ferre et al. (2014); de Belvis et al. (2022)). Since 2010 the quality of health care has been evaluated through the PNE (Piano Nazionale Esiti, see Lega and Prenestini (2024a) which is one of the most complete national healthcare evaluation models, with more than 60 outcome indicators. Overall, the system comprises a total of 170 outcome or process indicators and gives specific rankings of all hospitals or local health units. And although the main aim of the PNE however, is not ranking as such, but identify the providers with the poorest performance and encouraging them to conduct quality-of-care audits, the Plan may also be exploited by patients to evaluate the relative performance of hospitals.

4 Internet development in Italy

The advent of broadband and ultra-broadband in Italy represents a milestone in the country's digital transformation, although its deployment has been marked by significant territorial and temporal disparities. Broadband typically refers to high-speed internet access that is always on and faster than traditional dial-up access. In Italy broadband has primarily utilized DSL (Digital Subscriber Line) technologies, leveraging existing copper telephone lines to deliver internet speeds up to 20 Mbps.

Ultra-broadband encompasses more advanced technologies that deliver significantly higher speeds. These include VDSL (Very-high-bit-rate DSL), FTTC (Fiber to the Cabinet), and FTTH (Fiber to the Home), the latter providing speeds exceeding 1 Gbps. In alignment with the European Digital Agenda 2020, Italy launched its Strategy for Ultra-Broadband in 2015, with the objective of nationwide ultra-broadband connectivity. This strategy was further reinforced by the 2021 plan "Verso la Gigabit Society", aimed at gigabit connectivity throughout Italy by 2026. Key initiatives under this strategy include the White Areas Plan, targeting regions with no existing broadband infrastructure, and the Italia a 1 Giga Plan, to deliver 1 Gbps download and 200 Mbps upload speeds to 8.5 million units in underserved areas. These initiatives are supported by substantial investments including €6.7 billion allocated from the National Recovery and Resilience Plan for the ultra-broadband projects. Figure 1 shows the evolution of broadband coverage from 2013 to 2019. The three maps clearly show a significant improvement in broadband coverage across Italian regions. In 2013, coverage was generally low, with many regions falling below 50%. By 2016, perceptible progress had been made, especially in northern and central regions. And by 2019, coverage had reached high levels in most of the country, with several regions at 85–90% or more. This rapid growth highlights the effectiveness of national and regional investments in digital infrastructure over the decade. However, deployment has been uneven. Urban areas and northern regions have experienced faster and more comprehensive rollouts, while rural areas and the southern regions have lagged owing to infrastructural weaknesses and economic constraints. For instance, as of mid-2020, 99.6% of Italian households had access to at least one fixed broadband network, but only 33.7% had access to FTTP (Fiber to the Premises) networks. In rural areas, FTTP coverage was even lower, at 8.4%.

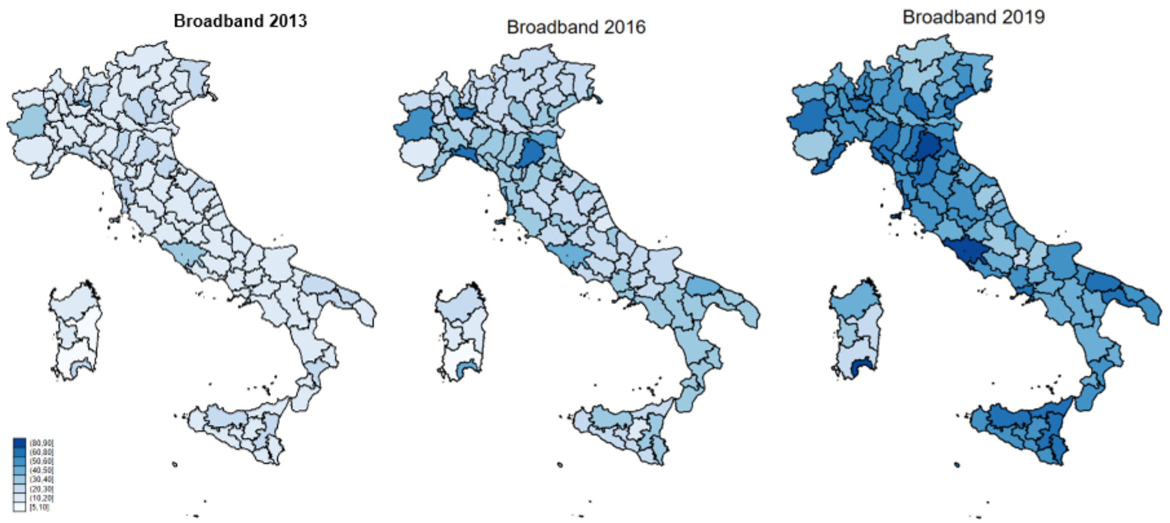

Figure 1: Broadband coverage in Italian provinces (2013, 2016, 2019)

5 Methods and Data

5.1 The regression model

To assess the effect of internet roll-out on patient mobility, we use the following model:

$$Y_{i,t} = \beta_1 BB_{i,t} + \gamma X_{i,t} + \eta_{r,t} + \epsilon_{i,t}$$

In this specification, $Y_{i,t}$ denotes the share of cancer patients, specifically those diagnosed with breast, lung, stomach, or pancreatic cancer—residing in province i and year t, who seek treatment outside their province of residence, relative to the total number of patients with each type of cancer in that province-year. The main explanatory variable $BB_{i,t}$ refers to broadband and ultra-broadband availability in province i and year t.

The vector $X_{i,t}$ comprises a set of control variables, including hospital quality indicators sourced from the Programma Nazionale Esiti (PNE), measured as the adjusted proportion of patients who die within 30 days of treatment, accounting for population-level risk factors [4]. We also include waiting times, defined as the number of days between the treatment booking and

[4] For breast cancer we have the rate of readmissions within 180 days for a new surgical intervention following breast cancer surgery.

hospitalization dates for each type of cancer. Institutional performance is captured through the Institutional Quality Index (IQI), a composite indicator developed by Nifo and Vecchione (2014) that reflects the quality of governance at the provincial and regional level. We control for economic conditions using GDP per capita and the employment rate.

The term $\eta_{r,t}$ captures region and year fixed effects, where r=(1..., 21) and y=(2013...,2019). Fixed effects aim at controlling for unobserved heterogeneity at the regional and temporal level, while $\epsilon_{i,t}$ represents the idiosyncratic error term.

5.2 The data

Dependent variable

The analysis is based on administrative data on hospital discharges for oncological treatments from all public and private licensed hospitals in the 21 Regional Health Services (RHSs), covering the period 2013–2019 for each province. We examine the percentage of adult patients (aged over 17) who receive oncological treatment outside their province of residence. This analysis, at provincial level, focuses as noted on four distinct types of cancer: breast, stomach, lung, and pancreatic. The dependent variable is defined as the proportion of patients, for each cancer type and province, who seek treatment in a different province. On average, 201,735 admission episodes for all periods came outside the patient's province of residence, interregional mobility thus accounting for 27% of total hospital admissions. This measure serves as an indicator of interprovincial cancer patient mobility.

Independent variables

We take data on broadband and ultra-broadband coverage for all 107 Italian provinces from 2013 to 2019, provided by Agcom (Autorità per le Garanzie nelle Comunicazioni). Assessing the digital divide within a country requires consideration of both broadband infrastructure availability and actual service utilization. Coverage, the variable defined as "broadband availability", indicates the extent of broadband infrastructure, typically measured by the number of lines deployed within a given area. Penetration, instead captured by the variable "broadband usage", reflects the extent to which these services are actually used, quantified by the number of active connections.

While extensive coverage signals the presence of infrastructure, it does not necessarily correspond to widespread use, which may be affected by factors like socio-economic conditions, digital literacy, and affordability. For this reason, we consider both dimensions: broadband coverage, the number of available broadband and ultra-broadband lines per capita ("broadband coverage (%)") and broadband penetration (as a robustness check), defined as the number of broadband and ultra-broadband subscriptions per capita ("broadband penetration (%)"). This dual approach permits a more comprehensive assessment of the digital divide at the provincial level, accounting for both infrastructure availability and actual uptake.

More specifically, we collect data on the total number of DSL, VDSL, FTTC, and FTTH lines, aggregated to provide a complete picture of connectivity in each province. In keeping with previous studies (Campante et al., 2018; Amaral-Garcia et al., 2024), Broadband coverage is the key explanatory variable. This choice is motivated by the fact that penetration is inherently endogenous, in that it reflects individual decisions on the adoption of broadband. Nevertheless, and as expected, coverage and penetration are positively correlated at the provincial level, the most granular level for which penetration data are available (Nardotto et al., 2015; Ahlfeldt et al., 2017).

5.3 Control variables

To account for potential confounding factors that could affect both patient mobility and digital infrastructure, we include a set of socio-economic and demographic control variables at province level Italian National Institute of Statistics (ISTAT) (2023).

Specifically, we include the share of the provincial population aged 65 and over, as older individuals tend to have greater healthcare needs and so may exhibit different patterns of inter-provincial and interregional mobility.

We also control for GDP per capita, expressed in thousands of euros, as a proxy for local economic development and income levels. To capture potential non-linear effects, we additionally include the logarithm of GDP per capita, which allows for diminishing marginal returns in its relationship with healthcare-seeking behavior and digital access.

Finally, we include the employment rate, measured as the ratio of total employment to the population aged 15 to 64. This variable reflects labor market conditions and overall economic activity, which can influence both access to healthcare care and the adoption of technology.

In addition to socio-economic and demographic variables, we incorporate measures of healthcare system performance and institutional quality to account for factors that may influence both patient mobility and digital infrastructure outcomes.

Healthcare quality data are obtained from the National Healthcare Outcomes Program (Programma Nazionale Esiti, PNE), developed by the Italian National Agency for Regional Healthcare Services (Agenas) in collaboration with the Ministry of Health Agenas (2009). The PNE provides over sixty clinically validated indicators for evaluating healthcare effectiveness and safety. From this dataset, we include four key quality indicators related to oncological care : the rate of readmissions within 180 days for a new surgical intervention following breast cancer surgery (variable "quality breast"); the thirty-day post-surgical mortality rate for malignant lung cancer, calculated as the number of deaths within 30 days of surgery divided by the total number of lung cancer surgeries (variable "quality lung"); the thirty-day mortality rate following stomach cancer surgery (variable "quality stomach"); and the thirty-day mortality rate following pancreatic cancer surgery (variable "quality pancreas"). These indicators are calculated for each province based on the PNE results of all LHAs at the provincial level. In addition, for each province, the mean PNE is also computed for the years under consideration.

To further assess healthcare accessibility, we include measures of waiting times for oncological treatments. These were estimated using SDO at the province level, aggregating data from all Local Health Authorities (LHAs) within each province. The indicators capture the number of days between booking and actual hospitalization for breast, lung, stomach, and pancreatic cancer treatments, respectively (variables "waiting time breast," "waiting time lung," "waiting time stomach," and "waiting time pancreas").

Finally, we control for institutional differences using the Institutional Quality Index (IQI) developed by (Nifo and Vecchione, 2014). The IQI is a composite measure of governance quality at the provincial and regional level, inspired by the World Governance Indicators (WGI) proposed by Kaufmann et al. (2011) and aligned with broader initiatives such as the European Quality of Government Index (EQI) by Charron et al. It is constructed using data from ISTAT and other national research institutes and encompasses five dimensions: (1) Voice and Accountability, which captures civic engagement, social cooperation, political participation, and cultural vibrancy; (2) Government Effectiveness, reflecting the quality of local public services and policy implementation (e.g., expenditure, waste management, environmental policies); (3) Rule of Law, measured through crime rates, judicial efficiency, tax evasion, and the size of the shadow economy; (4) Control of Corruption, based on crimes against the Public Administration; and (5) Regulatory Quality, indicating the ability of local governments to promote pro-business policies. IQI is scaled so that higher values correspond to higher levels of institutional quality and incorporates both formal (dimensions 2 to 5) and informal (dimension 1) institutional components. Our adoption of the IQI as a measure of local institutional quality is supported by a growing body of economic literature that employs this index in diverse empirical contexts, as in the works of Amendola et al. (2023), De Luca et al. (2021), Del Monte et al. (2022), D'Ingiullo and Evangelista (2020), Ferrara and Nisticò (2019). Incorporating this index allows us to account for how institutional environments can influence both healthcare system performance and the deployment and use of digital infrastructure. The descriptive statistics are provided in Table 1.

Table 1: Descriptive statistics

	Mean	St Dev	P10	Median	P90
Breast	0.34	0.25	0.07	0.30	0.73
Lung	0.44	0.29	0.08	0.41	0.88
Stomach	0.36	0.25	0.07	0.31	0.75
Pancreas	0.53	0.25	0.20	0.53	0.86
Broadband penetration(%)	24.38	5.15	18.04	23.96	31.01
Broadband coverage(%)	69.79	24.79	40.58	67.78	104.02
Quality breast	6.95	4.77	0.00	6.37	13.14
Quality lung	1.41	2.04	0.00	0.97	3.82
Quality stomach	3.17	4.32	0.00	0.00	9.45
Quality pancreas	1.94	4.94	0.00	0.00	5.52
Waiting time breast	0.75	0.22	0.49	0.73	1.03
Waiting time lung	0.42	0.15	0.27	0.40	0.59
Waiting time stomach	0.47	0.22	0.24	0.44	0.73
Waiting time pancreas	0.41	0.18	0.23	0.39	0.60
Pop over65	22.91	2.57	19.72	22.76	26.53
Quality of institution	0.60	0.25	0.23	0.68	0.86
Log(GDP per capita)	10.12	0.28	9.72	10.15	10.46
GDP per capita (/000 euro)	25.84	7.24	16.70	25.60	34.80
Employment over pop (%)	61.91	11.03	47.18	62.79	75.32

6 Results

This paper examines the impact of broadband coverage on patient mobility across provinces while broadband penetration is examined in the Appendix.

The first step of the empirical analysis investigates the impact of broadband coverage on patient mobility across provinces (Table 2). The estimations show a negative and statistically significant correlation between broadband coverage and patient mobility across provinces for the four health conditions considered. Specifically, one standard deviation increase in broadband coverage is associated with a reduction in patient mobility outside the province of residence ranging from 14% (for breast cancer) to 21% (for lung cancer). All coefficients are significant at the 1% level.

The inclusion of region-year fixed effects enhances the robustness of the estimates by controlling for unobserved heterogeneity. We opted for region-year fixed effects (rather than provincial fixed effects) because healthcare management is a regional responsibility in Italy. This level of disaggregation accurately captures institutional, organizational, and healthcare spending differences that vary across regions and over time but would be less meaningful or more homogeneous at province level.

The estimated coefficient decreases slightly (but not in significance) when additional controls are considered (Table 3), demonstrating the robustness of the relationship. **Other controls behave as expected: GDP per capita has a consistently negative effect (i.e. wealthier areas tend to retain more patients), and quality-related variables are mostly significant and directionally plausible. The adjusted R^2 increases substantially (from approximately 0.3 to 0.5), confirming the improved precision of the model.**

For broadband penetration (Table 10 in the Appendix) the pattern is similar: negative and statistically significant effects on patient mobility at province level. Although the coefficients are smaller than those in Table 3 (ranging from -0.02 to -0.07), they remain strongly significant. This suggests that not only infrastructural availability but also actual broadband use is a factor in reducing healthcare-related travel.

The R^2 values and fixed effects confirm the reliability of the estimates. The inclusion of controls (Table 11 in the Appendix) does not alter the main finding: broadband penetration remains significantly and negatively associated with patient mobility. Coefficients are slightly reduced but remain highly significant. As in Table 3, healthcare quality, GDP, and demographic variables are factors in explaining mobility patterns. The model fit improves ($R^2 \approx 0.45\breve{}0.57$), indicating the added explanatory value of the control variables.

Table 2: Broadband coverage and patient inter-provincial mobility

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband coverage	-0.143***	-0.217***	-0.155***	-0.196***
	(0.01)	(0.02)	(0.02)	(0.02)
Region-Year FE	Y	Y	Y	Y
Observations	749	749	749	749
Adjusted R-squared	0.381	0.375	0.341	0.335

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 3: Broadband coverage and patient inter-provincial mobility w/controls

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband coverage	-0.043***	-0.070***	-0.033**	-0.068***
	(0.01)	(0.02)	(0.02)	(0.02)
Pop over65	0.009*	0.014**	-0.002	0.006
	(0.01)	(0.01)	(0.01)	(0.00)
Quality of institution	-0.132	-0.137	0.046	-0.101
	(0.10)	(0.13)	(0.09)	(0.09)
GDP per capita (/000 euro)	-0.021***	-0.022***	-0.023***	-0.028***
	(0.01)	(0.01)	(0.00)	(0.00)
Employment over pop (%)	0.002	-0.002	0.003	0.006**
	(0.00)	(0.00)	(0.00)	(0.00)
Quality breast	-0.002			
	(0.00)			
Waiting time breast	0.070			
	(0.04)			
Quality lung		-0.042***		
		(0.01)		
Waiting time lung		0.017		
		(0.06)		
Quality stomach			-0.023***	
			(0.00)	
Waiting time stomach			0.042	
			(0.04)	
Quality pancreas				-0.014***
				(0.00)
Waiting time pancreas				0.156***
				(0.04)
Region-Year FE	Y	Y	Y	Y
Observations	735	700	742	735
Adjusted R-squared	0.452	0.564	0.556	0.521

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

For patients over 65, broadband coverage shows a statistically significant negative relationship with provincial mobility for all four cancer types (Table 4). The magnitudes are small, but consistently significant, confirming the digital divide's impact on healthcare access for seniors.

Table 4: Broadband coverage and inter-provincial mobility, patients 65+

	(1) Breast-over65	(2) Lung-over65	(3) Stomach-over65	(4) Pancreas-over65
Broadband coverage	-0.052***	-0.140***	-0.098***	-0.122***
	(0.01)	(0.01)	(0.01)	(0.01)
Region-Year FE	Y	Y	Y	Y
Observations	749	749	749	749
Adjusted R-squared	0.405	0.343	0.336	0.247

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

The inclusion of additional control variables (Table 5), show that broadband coverage continues to exhibit a statistically significant negative relationship with provincial mobility for all four cancer types.

Table 5: Broadband coverage and inter-provincial mobility for patients 65+ w/controls

	(1)	(2)	(3)	(4)
	Breast-over65	Lung-over65	Stomach-over65	Pancreas-over65
Broadband coverage	-0.017***	-0.043***	-0.023**	-0.049***
	(0.01)	(0.01)	(0.01)	(0.01)
Pop over65	0.006***	0.012***	0.002	0.008**
	(0.00)	(0.00)	(0.00)	(0.00)
Quality of institution	-0.068*	-0.129	0.013	-0.032
	(0.04)	(0.09)	(0.07)	(0.07)
GDP per capita (th euro)	-0.006***	-0.013***	-0.014***	-0.013***
	(0.00)	(0.00)	(0.00)	(0.00)
Employment over pop (%)	-0.000	-0.002	0.002	0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Quality breast	-0.001*			
	(0.00)			
Waiting time breast	0.033*			
	(0.02)			
Quality lung		-0.028***		
		(0.00)		
Waiting time lung		0.010		
		(0.04)		
Quality stomach			-0.014***	
			(0.00)	
Waiting time stomach			0.041	
			(0.03)	
Quality pancreas				-0.008***
				(0.00)
Waiting time pancreas				0.098***
				(0.03)
Region-Year FE	Y	Y	Y	Y
Observations	735	700	742	735
Adjusted R-squared	0.479	0.540	0.498	0.394

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

This reinforces the role of the digital divide in limiting healthcare access for older adults. Furthermore, per capita GDP and hospital quality show a statistically significant associations across all cancer types, albeit with lower coefficient values. These findings suggest that patient mobility among seniors decreases in the presence of higher broadband coverage, greater regional wealth, and better hospital quality. Finally , waiting time is significant only for pancreatic cancer. Specifically, a one standard deviation increase in pancreatic cancer waiting time is associated with a nearly 10% increase in patient mobility outside the province of residence.[5]

[5] These results are confirmed using broadband penetration in place of coverage. The reader may refer to Tables

6.1 Heterogeneity by macro area

In southern Italy, the effect of broadband coverage is significant only for lung cancer patients (Table 6). The magnitude is moderate (e.g., -0.126) and aligns with the expectation that digital access can reduce healthcare-related travel. Interestingly, institutional quality is strongly significant and positive in lung and stomach cancer models, possibly reflecting disparities between perceived and actual service quality. GDP per capita is strongly and negatively related to mobility, suggesting that wealth effects are more pronounced in the South. The adjusted R^2 values (up to 0.60) indicate robust model performance in this regional context. In central Italy (Table 7), broadband coverage is significantly and negatively associated with mobility for breast, stomach, and pancreatic cancers, though not for lung cancer. The largest effect is observed for breast cancer (-0.109), suggesting that broadband infrastructure may reduce mobility where local services are more easily substitutable. Waiting time for breast cancer care is strongly and positively associated with mobility (coefficient 0.361), and quality variables for stomach and pancreas show the expected negative signs. The explanatory power of the model is high (adjusted R^2 up to 0.63), reinforcing the robustness of results in this part of Italy. Finally, in northern Italy (Table 8), broadband coverage negatively and significantly affects mobility across all conditions. The effect is strongest for pancreatic cancer (-0.107), suggesting that broadband plays a key role in decentralizing care. Institutional quality is again positive and significant for breast, stomach, and pancreatic cancers, though not for lung cancer. Employment is also negative and significant for breast, stomach, and lung cancers, though not for pancreatic cancer. GDP variables are also significant and aligned with expectations (though not for pancreatic cancer). The model fits are consistently solid (R^2 values around 0.45–0.50), confirming that digital infrastructure impacts patient decisions even in the most highly developed regions.[6]

14 and 15 in the Appendix.

[6] These results are confirmed using broadband penetration in place of coverage. The reader may refer to Tables 11, 12 and 13 in the Appendix.

Table 6: Broadband coverage and patient inter-provincial mobility w/controls (South)

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband coverage	0.045	-0.126***	0.007	-0.019
	(0.05)	(0.05)	(0.04)	(0.03)
Quality of institution	0.174	0.891***	0.631***	0.054
	(0.21)	(0.21)	(0.19)	(0.18)
GDP per capita (th euro)	-0.085***	-0.054***	-0.071***	-0.060***
	(0.01)	(0.01)	(0.01)	(0.01)
Employment over pop (%)	0.004	-0.015***	0.002	0.005
	(0.01)	(0.00)	(0.00)	(0.00)
Quality breast	0.001			
	(0.00)			
Waiting time breast	0.040			
	(0.06)			
Quality lung		-0.037***		
		(0.01)		
Waiting time lung		0.116		
		(0.13)		
Quality stomach			-0.028***	
			(0.00)	
Waiting time stomach			0.103	
			(0.07)	
Quality pancreas				-0.013***
				(0.00)
Waiting time pancreas				0.140*
				(0.08)
Region-Year FE	Y	Y	Y	Y
Observations	252	259	259	259
Adjusted R-squared	0.365	0.499	0.597	0.514

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 7: Broadband coverage and patient inter-provincial mobility w/controls (Center)

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband coverage	-0.109***	-0.014	-0.067*	-0.104**
	(0.03)	(0.03)	(0.04)	(0.05)
Quality of institution	-0.155	-0.212	-0.113	-0.101
	(0.26)	(0.25)	(0.19)	(0.20)
GDP per capita (th euro)	-0.013	-0.033***	-0.017*	-0.025**
	(0.01)	(0.01)	(0.01)	(0.01)
Employment over pop (%)	-0.007	-0.001	-0.006	0.000
	(0.00)	(0.01)	(0.01)	(0.01)
Quality breast	-0.004			
	(0.00)			
Waiting time breast	0.361***			
	(0.12)			
Quality lung		-0.084**		
		(0.03)		
Waiting time lung		0.038		
		(0.11)		
Quality stomach			-0.015***	
			(0.01)	
Waiting time stomach			0.133	
			(0.10)	
Quality pancreas				-0.022**
				(0.01)
Waiting time pancreas				0.266***
				(0.07)
Region-Year FE	Y	Y	Y	Y
Observations	154	147	154	154
Adjusted R-squared	0.573	0.633	0.597	0.553

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 8: Broadband coverage and patient inter-provincial mobility w/controls (North)

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband coverage	-0.044***	-0.085***	-0.036**	-0.107***
	(0.01)	(0.02)	(0.02)	(0.02)
Quality of institution	0.274***	0.118	0.587***	0.704***
	(0.09)	(0.19)	(0.11)	(0.16)
GDP per capita (th euro)	0.009**	0.012*	0.009**	-0.007
	(0.00)	(0.01)	(0.00)	(0.01)
Employment over pop (%)	-0.012***	-0.018***	-0.014***	-0.004
	(0.00)	(0.00)	(0.00)	(0.00)
Quality breast	-0.010***			
	(0.00)			
Waiting time breast	-0.098**			
	(0.04)			
Quality lung		-0.027***		
		(0.01)		
Waiting time lung		0.001		
		(0.08)		
Quality stomach			-0.022***	
			(0.00)	
Waiting time stomach			-0.017	
			(0.05)	
Quality pancreas				-0.007***
				(0.00)
Waiting time pancreas				0.089
				(0.08)
Region-Year FE	Y	Y	Y	Y
Observations	329	294	329	322
Adjusted R-squared	0.473	0.481	0.502	0.450

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

7 Conclusions

This paper uses Italian administrative data on oncological procedures from 2013 to 2019 to provide new empirical evidence that the diffusion of broadband internet can influence patient mobility within a decentralized healthcare system. Our results indicate that enhanced broadband coverage significantly reduces cross-provincial patient mobility, particularly for complex cancers with lower survival rates. This effect is most pronounced among younger patients and those living in the south of Italy, suggesting that improved digital connectivity can help mitigating long-standing regional inequalities in perceived healthcare quality. An interesting avenue for future research would be to consider the role of mobile internet, since patients may increasingly rely on smartphones or tablets to access health-related information. At present, however, the lack of reliable data and the methodological challenges in geolocating patients through mobile connections represent important limitations that prevent a systematic analysis of this dimension. These findings contribute to two important strands of economic research. First, they underscore the role of information frictions in healthcare markets. Whereas previous studies have examined the impact of public report cards and performance transparency on patient choice (e.g. Gaynor et al. (2016), our analysis demonstrates that the broader infrastructure of information access, namely high-speed internet, are equally important in shaping healthcare-seeking behavior. Second, we add to the literature on the socio-economic impacts of digital infrastructure (Van Parys and Brown, 2024), providing robust evidence that broadband diffusion has implications beyond productivity and innovation, extending to public service utilization, patient empowerment, and health equity.

From a policy standpoint, our findings can have important implications for national health authorities and digital inclusion strategies. Investments in broadband infrastructure may constitute an indirect yet effective tool for improving healthcare efficiency by reducing inappropriate inter-regional mobility. This is particularly relevant in decentralized systems like Italy, where patients are free to choose providers across regions, but healthcare financing is partially determined by inter-regional reimbursement flows. Reducing inappropriate mobility not only reduces costs for patients who have to bear the financial and emotional burden of travel, but also reduces fiscal pressure on the national healthcare system. In this way, the redistribution of healthcare funds from poorer southern regions (which are net exporters of patients) to wealthier northern ones (which are net recipients) (GIMBE, 2025), Berta et al. (2010), Carnazza et al. (2024) may be reduced with a significant welfare improvement.

At the same time, our findings suggest that digital infrastructure alone is not sufficient. The effectiveness of broadband access in improving patient decision-making depends on the quality, clarity, and coherence of the information that patients obtain online. Currently, hospital websites often serve mainly as promotional tools, selectively highlighting positive performance indicators or amenities in order to attract patients from other regions given that inter-regional mobility is a source of additional revenue. Such incomplete and often biased presentation may bias patients quality perceptions(Martini et al., 2022b). To counteract this, national governments intervention is crucial; it must provide a unified, transparent, and user-friendly platform for comparing hospital quality. Initiatives such as Italy's PNE are a step in this direction, offering standardized and detailed clinical performance data (Lega and Prenestini, 2024b). However, the positive impact of such platforms depends heavily on being accessible and comprehensible to the average user.

Therefore, bridging the digital divide must be accompanied by efforts to improve health information design and literacy. National authorities need to make sure that public reporting tools are not only technically accurate but also easily interpretable and relevant for patients facing urgent or complex treatment decisions. In this regard, centralizing quality indicators supported by clear visualizations and summaries could enhance the trust in and usage of such tools, minimizing the need for self-promotional hospital websites.

Finally, future research should investigate whether similar dynamics emerge beyond oncology, for treatments such as elective surgery, chronic disease management, or mental health services. Comparative studies across other decentralized health systems could further inform best practices allowing to combine digital infrastructure investments with centralized information governance. In this respect, incorporating mobile internet connectivity into the analysis would be particularly valuable, as it may represent the main channel through which patients access information in everyday life. Yet, this extension remains challenging, due to both the limited availability of high-quality mobile data and the complexity of imputing patient location based on mobile connections.

A Appendix

A.1 Broadband Penetration as Independent variabel

As a robustness check, we replace broadband *coverage* with broadband *penetration* as the main explanatory variable (Table 9 and 10). While analysis in the paper focuses on coverage (the infrastructural availability of broadband) in this appendix we test whether actual broadband usage (penetration) has comparable effects.

The findings presented below confirm the main results: broadband penetration shows a negative and statistically significant association with inter-province patient mobility for all four cancer types. However, the magnitude of the coefficients (Table 9) is slightly smaller, ranging from -0.107 (stomach cancer) to -0.160 (lung cancer). All effects are significant, most at the 1% level, underscoring the robustness of the relationship.

These results suggest that not only the presence of broadband, but also its actual use helps to reduce healthcare-related travel, especially for older patients. The inclusion of region-year fixed effects to control for time-varying regional differences in healthcare systems, is consistent with the main specification.

When control variables are added (Table 10), the negative relationship between broadband penetration and patient mobility is still statistically significant. As in the analysis in the text, per capita GDP and healthcare quality are also negatively associated with mobility, thus confirming that wealthier areas with better hospitals tend to retain more patients. The adjusted R^2 range from 0.45 to 0.57, indicating good model fit and further confirming the reliability of the results. As per hospital quality, estimates show a consistent and significant negative association with patient mobility for three out of the four cancer types. Specifically, the quality indicator is statistically significant at the 1% level for lung, stomach, and pancreatic cancer, with negative coefficients, suggesting that higher hospital quality reduces the need for patients to seek care outside their province of residence. The only exception is breast cancer, for which hospital quality has no statistically significant effect.

Table 9: Broadband penetration and patient inter-provincial mobility

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband penetration	-0.114***	-0.160***	-0.107***	-0.130***
	(0.01)	(0.01)	(0.01)	(0.01)
Region-Year FE	Y	Y	Y	Y
Observations	749	749	749	749
Adjusted R-squared	0.397	0.377	0.327	0.300

Standard errors in parentheses
* $p < .1$, ** $p < .05$, *** $p < .01$

Table 10: Broadband penetration and patients' provincial mobility w/controls

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband penetration	-0.036***	-0.069***	-0.023*	-0.032***
	(0.01)	(0.01)	(0.01)	(0.01)
Pop over65	0.009*	0.014**	-0.002	0.005
	(0.00)	(0.01)	(0.01)	(0.00)
Quality of institution	-0.098	-0.092	0.069	-0.073
	(0.10)	(0.12)	(0.09)	(0.10)
GDP per capita (/000 euro)	-0.020***	-0.019***	-0.023***	-0.031***
	(0.00)	(0.01)	(0.00)	(0.00)
Employment over pop (%)	0.002	-0.004	0.003	0.007***
	(0.00)	(0.00)	(0.00)	(0.00)
Quality breast	-0.003			
	(0.00)			
Waiting time breast	0.063			
	(0.04)			
Quality lung		-0.041***		
		(0.01)		
Waiting time lung		0.005		
		(0.06)		
Quality stomach			-0.023***	
			(0.00)	
Waiting time stomach			0.042	
			(0.04)	
Quality pancreas				-0.014***
				(0.00)
Waiting time pancreas				0.154***
				(0.04)
Region-Year FE	Y	Y	Y	Y
Observations	735	700	742	735
Adjusted R-squared	0.453	0.571	0.556	0.513

Standard errors in parentheses
* $p < .1$, ** $p < .05$, *** $p < .01$

A.1.1 Macroareas

Table 11: Broadband penetration and patient inter-provincial mobility w/controls (South)

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband penetration	-0.006	-0.088***	-0.010	-0.047**
	(0.03)	(0.03)	(0.02)	(0.02)
Quality of institution	0.167	0.900***	0.627***	0.054
	(0.21)	(0.20)	(0.19)	(0.17)
GDP per capita (/000 euro)	-0.077***	-0.049***	-0.067***	-0.051***
	(0.01)	(0.01)	(0.01)	(0.01)
Employment over pop (%)	0.003	-0.015***	0.001	0.004
	(0.01)	(0.00)	(0.00)	(0.00)
Quality breast	0.002			
	(0.00)			
Waiting time breast	0.052			
	(0.06)			
Quality lung		-0.037***		
		(0.01)		
Waiting time lung		0.107		
		(0.13)		
Quality stomach			-0.028***	
			(0.00)	
Waiting time stomach			0.104	
			(0.07)	
Quality pancreas				-0.013***
				(0.00)
Waiting time pancreas				0.148*
				(0.08)
Region-Year FE	Y	Y	Y	Y
Observations	252	259	259	259
Adjusted R-squared	0.362	0.503	0.597	0.525

Standard errors in parentheses
* $p < .1$, ** $p < .05$, *** $p < .01$

Table 12: Broadband penetration and patient inter-provincial mobility w/controls (Center)

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband penetration	0.022	0.086**	0.016	-0.019
	(0.04)	(0.04)	(0.03)	(0.04)
Quality of institution	-0.254	-0.159	-0.135	-0.122
	(0.24)	(0.25)	(0.20)	(0.20)
GDP per capita (th euro)	-0.025**	-0.045***	-0.025**	-0.033**
	(0.01)	(0.01)	(0.01)	(0.01)
Employment over pop (%)	-0.004	0.001	-0.005	0.001
	(0.00)	(0.01)	(0.01)	(0.01)
Quality breast	-0.002			
	(0.01)			
Waiting time breast	0.374***			
	(0.13)			
Quality lung		-0.108***		
		(0.03)		
Waiting time lung		0.020		
		(0.10)		
Quality stomach			-0.015***	
			(0.01)	
Waiting time stomach			0.161*	
			(0.10)	
Quality pancreas				-0.016*
				(0.01)
Waiting time pancreas				0.247***
				(0.08)
Region-Year FE	Y	Y	Y	Y
Observations	154	147	154	154
Adjusted R-squared	0.546	0.644	0.588	0.529

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 13: Broadband penetration and patient inter-provincial mobility w/controls (North)

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband penetration	-0.018**	-0.052***	0.002	-0.016
	(0.01)	(0.02)	(0.01)	(0.02)
Quality of institution	0.292***	0.106	0.589***	0.642***
	(0.09)	(0.18)	(0.11)	(0.17)
GDP per capita (/000 euro)	0.006	0.007	0.004	-0.020***
	(0.00)	(0.01)	(0.00)	(0.01)
Employment over pop (%)	-0.011***	-0.017***	-0.012***	0.002
	(0.00)	(0.00)	(0.00)	(0.00)
Quality breast	-0.011***			
	(0.00)			
Waiting time breast	-0.124***			
	(0.04)			
Quality lung		-0.029***		
		(0.01)		
Waiting time lung		-0.087		
		(0.08)		
Quality stomach			-0.023***	
			(0.00)	
Waiting time stomach			-0.028	
			(0.05)	
Quality pancreas				-0.010***
				(0.00)
Waiting time pancreas				0.050
				(0.08)
Region-Year FE	Y	Y	Y	Y
Observations	329	294	329	322
Adjusted R-squared	0.460	0.472	0.493	0.400

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 14: Broadband penetration inter-provincial mobility, patients 65+ w/controls

	(1) Breast-over65	(2) Lung-over65	(3) Stomach-over65	(4) Pancreas-over65
Broadband penetration	-0.007*	-0.033***	-0.016*	-0.004
	(0.00)	(0.01)	(0.01)	(0.01)
Pop over65	0.009***	0.019***	0.004	0.013***
	(0.00)	(0.00)	(0.00)	(0.00)
Quality of institution	-0.041	-0.072	0.037	0.005
	(0.04)	(0.08)	(0.06)	(0.07)
GDP per capita (/000 euro)	-0.003*	-0.004	-0.012***	-0.014***
	(0.00)	(0.00)	(0.00)	(0.00)
Employment over pop (%)	-0.001	-0.006***	0.001	0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Bedpct	-0.229***	-0.521***	-0.142*	-0.351***
	(0.04)	(0.08)	(0.08)	(0.09)
Quality breast	-0.002**			
	(0.00)			
Waiting time breast	0.023			
	(0.02)			
Quality lung		-0.025***		
		(0.00)		
Waiting time lung		0.018		
		(0.04)		
Quality stomach			-0.013***	
			(0.00)	
Waiting time stomach			0.041	
			(0.03)	
Quality pancreas				-0.008***
				(0.00)
Waiting time pancreas				0.086***
				(0.03)
Region-Year FE	Y	Y	Y	Y
Observations	735	700	742	735
Adjusted R-squared	0.512	0.585	0.501	0.404

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 15: Broadband coverage and patient inter-provincial mobility w/controls

	(1) Breast	(2) Lung	(3) Stomach	(4) Pancreas
Broadband coverage	-0.037***	-0.073***	-0.031**	-0.065***
	(0.01)	(0.02)	(0.02)	(0.02)
Bedpct	-0.655***	-0.805***	-0.372***	-0.572***
	(0.09)	(0.12)	(0.11)	(0.11)
Pop over65	0.020***	0.026***	0.005	0.016***
	(0.00)	(0.01)	(0.01)	(0.00)
Quality of institution	-0.081	-0.089	0.066	-0.044
	(0.09)	(0.12)	(0.09)	(0.09)
GDP per capita (th euro)	-0.011**	-0.009*	-0.017***	-0.019***
	(0.00)	(0.01)	(0.00)	(0.00)
Employment over pop (%)	-0.002	-0.008***	0.001	0.003
	(0.00)	(0.00)	(0.00)	(0.00)
Quality breast	-0.003			
	(0.00)			
Waiting time breast	0.053			
	(0.04)			
Quality lung		-0.037***		
		(0.01)		
Waiting time lung		0.041		
		(0.06)		
Quality stomach			-0.022***	
			(0.00)	
Waiting time stomach			0.043	
			(0.04)	
Quality pancreas				-0.013***
				(0.00)
Waiting time pancreas				0.146***
				(0.04)
Region-Year FE	Y	Y	Y	Y
Observations	735	700	742	735
Adjusted R-squared	0.495	0.605	0.568	0.552

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

A.2 Broadband coverage controlling for different hospital quality

Table 16: Broadband coverage and patients' provincial mobility w/controls (with $\Delta Quality$)

	(1) breast	(2) lung	(3) stomach	(4) pancreas
Broadband coverage(%)	-0.045***	-0.072***	-0.039**	-0.070***
	(0.01)	(0.02)	(0.02)	(0.02)
Pop over65	0.010*	0.015**	0.002	0.006
	(0.01)	(0.01)	(0.01)	(0.00)
Quality of institution	-0.137	-0.126	0.027	-0.067
	(0.10)	(0.13)	(0.09)	(0.09)
GDP per capita (th euro)	-0.021***	-0.020***	-0.021***	-0.028***
	(0.01)	(0.01)	(0.00)	(0.00)
Employment over pop (%)	0.002	-0.004	0.002	0.006**
	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Qualitybreast$	0.001			
	(0.00)			
Waiting time breast	0.068			
	(0.04)			
$\Delta Qualitylung$		0.038***		
		(0.00)		
Waiting time lung		-0.016		
		(0.06)		
$\Delta Qualitystomach$			0.020***	
			(0.00)	
Waiting time stomach			0.033	
			(0.04)	
$\Delta Qualitypancreas$				0.011***
				(0.00)
Waiting time pancreas				0.148***
				(0.04)
Observations	735	700	735	735
Adjusted R-squared	0.451	0.567	0.569	0.512

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

A.2.1 Macroareas

Table 17: Broadband coverage and patients' provincial mobility w/controls (South$\Delta Quality$)

	(1) breast	(2) lung	(3) stomach	(4) pancreas
Broadband coverage(%)	0.041	-0.119***	-0.004	-0.026
	(0.05)	(0.04)	(0.04)	(0.03)
Quality of institution	0.169	0.925***	0.392**	0.110
	(0.21)	(0.20)	(0.19)	(0.18)
GDP per capita (th euro)	-0.085***	-0.051***	-0.070***	-0.060***
	(0.01)	(0.01)	(0.01)	(0.01)
Employment over pop (%)	0.004	-0.015***	0.004	0.009*
	(0.01)	(0.00)	(0.00)	(0.00)
$\Delta Qualitybreast$	-0.002			
	(0.00)			
Waiting time breast	0.040			
	(0.06)			
$\Delta Qualitylung$		0.038***		
		(0.00)		
Waiting time lung		0.076		
		(0.12)		
$\Delta Qualitystomach$			0.022***	
			(0.00)	
Waiting time stomach			0.080	
			(0.07)	
$\Delta Qualitypancreas$				0.011***
				(0.00)
Waiting time pancreas				0.126
				(0.08)
Observations	252	259	258	259
Adjusted R-squared	0.368	0.527	0.592	0.520

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 18: Broadband coverage and patients' provincial mobility w/controls (Center $\Delta Quality$)

	(1) breast	(2) lung	(3) stomach	(4) pancreas
Broadband coverage(%)	-0.106***	-0.030	-0.068*	-0.089*
	(0.03)	(0.03)	(0.04)	(0.05)
Quality of institution	-0.147	-0.364	-0.106	-0.055
	(0.27)	(0.25)	(0.19)	(0.20)
GDP per capita (th euro)	-0.012	-0.034***	-0.017*	-0.029**
	(0.01)	(0.01)	(0.01)	(0.01)
Employment over pop (%)	-0.007	-0.000	-0.005	-0.001
	(0.00)	(0.01)	(0.01)	(0.01)
$\Delta Qualitybreast$	0.004			
	(0.00)			
Waiting time breast	0.365***			
	(0.12)			
$\Delta Qualitylung$		0.044		
		(0.03)		
Waiting time lung		0.051		
		(0.12)		
$\Delta Qualitystomach$			0.018***	
			(0.01)	
Waiting time stomach			0.103	
			(0.09)	
$\Delta Qualitypancreas$				0.010
				(0.01)
Waiting time pancreas				0.234***
				(0.07)
Observations	154	147	154	154
Adjusted R-squared	0.574	0.610	0.616	0.534

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 19: Broadband coverage and patients' provincial mobility w/controls (North $\Delta Quality$)

	(1) breast	(2) lung	(3) stomach	(4) pancreas
Broadband coverage(%)	-0.043***	-0.085***	-0.051***	-0.112***
	(0.01)	(0.02)	(0.02)	(0.02)
Quality of institution	0.274***	0.149	0.596***	0.770***
	(0.09)	(0.19)	(0.11)	(0.16)
GDP per capita (th euro)	0.010**	0.015**	0.009**	-0.005
	(0.00)	(0.01)	(0.00)	(0.01)
Employment over pop (%)	-0.013***	-0.021***	-0.014***	-0.005
	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Qualitybreast$	0.008***			
	(0.00)			
Waiting time breast	-0.100**			
	(0.04)			
$\Delta Qualitylung$		0.020***		
		(0.01)		
Waiting time lung		-0.030		
		(0.08)		
$\Delta Qualitystomach$			0.017***	
			(0.00)	
Waiting time stomach			0.005	
			(0.05)	
$\Delta Qualitypancreas$				0.004
				(0.00)
Waiting time pancreas				0.087
				(0.08)
Observations	329	294	323	322
Adjusted R-squared	0.468	0.474	0.508	0.443

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

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