Master of Public Health

Master de Santé Publique

The impact of zoning and its associated financial aid since 2005 on the installation of General Practitioners in France

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List of Acronyms

ATT	Average Treatment Effect on the Treated
CDS	Centres de Santé
CNOM	Conseil National de l'Ordre des Médecins
GP	General Practitioner
HHR	Healthcare Human Resources
HIC	High Income Countries
MSP	Maison de sante pluriprofessionnelles
NHI	National Health Insurance
PCT	Primary Care Team
PHC	Primary Health Care
RHA	Regional Health Authority/CPAM
SNDS	Système national des données de santé
WHO	World Health Organization
ZAP	zones d'action complémentaire
ZIP	zones d'Intervention prioritaire
ZV	zones de vigilance
ZAFR	Zones à finalité régionale
ZMG	Zonages médecins généralistes
ZRR	Zone de Revitalization Rurale

Abstract

Introduction/Background: Healthcare Human Resources geographical imbalances are a serious concern in public health worldwide. Primarily, unequal access and utilization of primary health care services among urban, rural, and peri-urban areas are due to a disproportionate distribution of primary health workers, specifically General Practitioners (GPs). France is also suffering from uneven distribution of GPs in urban and rural areas as in many other countries. Thus, France has implanted zoning and its associated financial incentives policies since 2005 in desired municipalities to reduce the imbalanced geographical distribution of GPs across metropolitan France.

Methods and Materials: To assess the effects of programs that combine zoning and financial incentives (financial grants and/or tax exemption), an analysis was conducted using aggregated data at the municipality level – from 34,924 municipalities across metropolitan France –, covering the period from 2005 to 2022 and based on difference-in-differences quasi-experimental design for causal inference evaluation of public policy and intervention. The data was a secondary data received from the *Conseil National de l'Ordre des Médecins* (CNOM) and from the National Health Insurance (*Système national des données de santé, SNDS)*.

Results: This study finds that zoning and its associated financial incentives do not have a positive effect on the installation and retention of GPs under 40-year-old. Tax exemptions have an insignificant impact, and financial grants show a significant negative effect in the analysis. However, municipalities that benefited from the Primary Care Team location experiment had a positive and significant impact *on the density of* GPs under 40 years old.

Conclusion: Considering the results of this study and existing literature financial incentives seem to be not relevant to reducing geographical imbalance by comparison with policies that focus on working conditions like Primary Care Teams.. Consequently, policies that aim to promote team practices for GPs are considered effective in reducing the imbalance in the distribution of GPs across municipalities.

Keywords: Health Human resources, attraction and retention of GPs, Zoning and financial incentives, Primary care team

Introduction

Health care accessibility is a major issue for public health notably regarding primary health care. According to the WHO, healthcare service accessibility and utilization are two factors of population health status, including the physical, social, and economic environment and a person's individual characteristics (income, social status, education, genetics, sex) and behaviors (Ono, 2014). Primary health care (PHC), which is delivered by different categories of health care professionals and organizations, including GPs, supposedly provides accessibility, continuity, comprehensiveness, coordination, and orientation and, as a consequence, is considered to be a pillar for both improving accessibility and reducing health inequalities (Guagliardo, 2004) and delivering high-quality care (Kringos et al., 2013).

Healthcare accessibility depends on several dimensions: availability of health human resources (HHR), geographical accessibility, accommodation, affordability, and acceptability (Pechansky et Thomas, 1981). The unequal geographical distribution of HHR (Ryvicker, 2017), especially in primary care, is a major issue because it directly affects the following components of access: availability and spatial accessibility.

Healthcare human resources planning can be defined as assessing the right number of people with the right skills in the right place at the right time, to provide the right services to the right people (Lopes et al., 2015). Healthcare Human Resources (HHR) planning is a very crucial field in public health and governance because it ensures qualified staffing, improves patient care, boosts employee retention, adapts to change, and maintains compliance as long as it is devised properly. Over the past 5 decades, there have been consistent attempts and efforts to develop and improve the concept and better understand and provide a way forward for the problems faced in HHR planning. Nonetheless, there are inequalities in healthcare access due to HHR geographical imbalances. This is not only the case in low- and middle-income countries, but also in high-income countries, too. In general, rural and remote areas globally are more affected by HHR imbalance compared to metropolitan areas. Numerous studies and data suggest that rural and remote areas in high-income countries (HICs) such as Australia, Canada, and the USA possess a range of vulnerabilities and suffer from disparities in health outcomes due to socio-economic factors, heightened health risk factors, and poorer healthcare access compared to urban areas (Russell et al., 2021).

Numerous literature reviews focused on the main determinants of practice location for doctors and specifically for GPs. It seems that beyond expected income, the main determinants are related to the geographical and family attachment, the perception of and preferences with place and location (environmental, services and other amenities, working opportunity for spouse, etc.), practice and working conditions (workload, teamwork, etc.). These determinants call for an integrated approach encompassing multiple policies occurring at different periods of the GPs' work life cycle and that addressed each of these specific factors of HHR attraction and retention in underserved areas. Policies such as providing and adapting initial education, granting financial support and financial incentives, adopting adequate and appropriate regulations, and ensuring professional and personal support might help tackle the HHR imbalance.

Increasing the number of students, recruiting foreign graduates, and recognizing previous learning help to increase the number of students educated in medicine. Over selecting students coming from medically underserved areas is another way to increase the proportion of them that would locate their practice in these areas after graduation. Finally, integrating topics related to rural areas in the curriculum, early and frequent exposure to rural settings during medical school, medical schools built in rural areas, rural rotations, longitudinal rural residency opportunities, and attitudes about rural practice in medical school also determined the future attraction and retention in rural settings. All these lead to a reduction in the gap in the health professionals' geographical distribution (Lopes et al., 2015) and (Asghari et al., 2020).

When the supply curve is elastic to increase income, the assumption of increasing wages might be a suitable option to target geographical imbalance. However, studies suggest that the physician's supply curve is not significantly elastic to an increase in income. Consequently, attracted or well-settled physicians will not opt to move to rural and remote areas solely receiving financial incentives (Ono et al., 2014; Russel et al., 2021; Bes et al., 2023). A study by (McIsaac et al., 2019) indicates that less than 1% of GPs would relocate in response to a hypothetical and costly income increase of 10%. The institutional report in France also suggests that financial incentives would be ineffective (Augros, 2019; Cour des comptes, 2024).

Putting in effect regulations that facilitate healthcare access will certainly contribute positively to interventions targeting HHR geographical imbalance. That being said, if France implemented licensure limitations in case of oversupply for nurses, physiotherapists, and midwives, it was never extended to doctors and considered as limited in a period of shortage and less and less overserved areas.

Finally, personal support, such as providing better living conditions, or professional support like improving working conditions, notably regarding workload, are highly associated with retention and recruiting of the healthcare workforce in rural and remote areas.

While the first one (personnel) is not really in the hands of the health care policy but, moreover, of the spatial planning policy, the second one calls for specific policies. It could be in favor of the support for attractive working conditions like proximity with other levels of care, practice type in favor of flexible working hours, controlled workload, easy shift and rotation like group practices.

France, a European developed country, is not an exception and it is suffering from HHR imbalance throughout the country. The French healthcare system utilizes the gate-keeping method in which the General Practitioners are the first point of contact to access healthcare. France not only suffers from an uneven distribution of GPs across the country but has also suffered from an insufficient supply of GPs for decades. As stated above, the imbalance is more dominant in rural and remote areas. To minimize the impacts of these imbalances on health outcomes of the population, tackle medical desertification, and facilitate access to healthcare, France has implemented numerous programs in underserved areas through public authorities (State, National Health Insurance, and local authorities) such as increasing the number of medical students, implementing financial incentives in underserved areas, more recently improving the working conditions through the support for Primary Care Teams or improving both studying and early career living and working conditions thanks to policies at the local level (Chevillard et al.,2019; Polton et al.,2021; Jedat et al., 2022; Mousquès, 2023).

Among the deployed measures, while financial incentives appear to be one of the very oldest policy levers they seem to have small to very moderate effects and surprisingly not being robustly evaluated as they should be (Cour des comptes, 2024). On the contrary Primary Care Team support has shown encouraging results in its capacity to retain and attract young doctors in underserved areas (Chevillard and Mousquès, 2021). Since zoning policy and the provision of financial incentives have not been systematically evaluated, this thesis aims to evaluate the impact of zoning and its associated financial aid programs on the installation of young General Practitioners (GPs under the age of 40) in France. To evaluate the aforementioned programs, the analysis is performed on aggregate data at the municipality level from 34,924 municipalities across metropolitan France over the period 2005-2022 and based on a quasi-experimental design to estimate causal inference.

Institutional Background

To confront HHR imbalance, prevent medical desertification, and improve access to healthcare, the French public authorities (State, National Health Insurance, and local authorities) have progressively implemented several policies or responses at the national and local levels (Chevillard et al., 2019; Jedat et al., 2022; Polton et al., 2021).

At the national level, policies involved in the educational sector are the oldest to date. The number of doctors graduating from universities has been regulated since 1971 with the introduction of *numerus clausus,* but territorial distribution had not been addressed before the mid-2000s. In the 2000s, concerns started to rise about the future decline of doctors and their imbalanced distribution around the country. Therefore, *numerus clausus* (annual quota of medical graduates that have access to the second year of medicine education) was incrementally increased and regionalized in 2012 to increase the number of physicians in medically under-resourced areas. However, this measure had a limited and mixed effect due to heterogeneity in physicians' fidelity to their place of training (Cardoux and Daudigny, 2017).

Secondly, the state aims to increase the number of GPs practicing by offering the possibility to combine employment with retirement. It allows physicians in practice to continue working after their retirement and combine their income from self-employment and retirement (Chevillard et al., 2023).

Another measure deployed is zoning and its associated financial aid policies. It was first introduced in 2005 to induce GPs to start practicing in areas identified as under-populated (Legendre., 2021). Also, territorial priority zoning program simultaneously targets socio-economically deprived areas, both in urban and rural settings that are considered priority territories. In these areas, health workers receive installation aid in addition to financial incentives provided by zoning policy.

The physician zoning defines areas identified as having insufficient healthcare provision or difficulties in accessing healthcare. It is defined by the Regional Health Agency (RHA) and the current zoning in place was defined in 2021. RHA uses common methodological approach to define *Zones d'Intervention Prioritaire* (ZIP), *zones d'action complémentaire* (ZAP), and *zones de vigilance* (ZV). Each classification has different characteristics, and these zones are eligible for different types of financial support and/or incentives. Since the focus of this study is the impact of

zoning and its associated financial incentives, the *ZAFR*, *ZMG* and *ZRR financial incentives* are described below.

The Zones à finalité régionale (ZAFR) are areas that encompass both cross-border and sub-state areas and supported by European Union policies. ZAFR were established in 2005 and reformed in 2007 and 2013. The zoning of the ZAFR has a dual objective in terms of spatial planning and competitiveness, based on criteria of activity and wealth (GDP), employment and population size. Businesses, including GPs, located in municipalities classified as ZAFR receive investment grants and income tax exemptions (total then partial and for 5 years). The proportion of municipalities classified in ZAFR remained stable at around 11 to 14% over the period 2005-2022.

The Zonages médecins généralistes (ZMG) identify municipalities for which the supply of general practitioners (density) is considered insufficient. GPs in these municipalities may receive financial incentives to set up (5 years grants, 50 000€) and/or maintain their practice (5000€ grant by year for 3 years). The ZMG were established in 2017, preceded by areas with deficit in 2008 and under-endowed areas in 2005. For convenience we use the term ZMG for these three policies. The proportion of municipalities classified as ZMG increased by stages, with less than 1% of municipalities between 2005 and 2011, 13% between 2012 and 2017, 77% between 2018 and 2021 and 89% in 2022.

The Zones de Revitalisation Rurale (ZRR), were established by the Act of Orientation for the Planning and Development of the Territory of 4 February 1995 to support the most socially and economically vulnerable rural territories, based on population density and tax revenue criteria. They were reformed in 2005, then in 2017 and 2018. The businesses located in ZRR, including GPs, benefit from income tax exemption (total then partial and for 5 years). In 2005, 37% of municipalities were classified as ZRR, by 2022 they were 50%.

Lastly, the State and National Health Insurance in France have encouraged Primary Care Teams (PCT). This policy mainly targets healthcare centers (*centres de santé, CDS*) and multidisciplinary group practices (*maisons de santé pluriprofessionnelles*, MSP). CDS are mainly paid by fee-for-services, but their staff are paid by salaries, however, healthcare professionals practicing in MSPs are paid mainly by fee-for-services (Cassou et al. 2023; Bergeat et al., 2022).

At the local level, authorities (municipalities, sub-municipalities, counties) have been working in close coordination with the Regional Health Authority since 2005 to retain and attract GPs (Polton et al., 2021, Jedat, 2022, Banques des territoires, 2024). The policies set up by local authorities

target medical students and GPs substitutes (e.g., transport or accommodation aid), foreign-trained doctors (e.g., recruiting firm, French classes), the first installation (e.g., zero-interest loans, installation bonus, reduced rent), and working conditions (PCTs co-financing).

Materials and Methods

To assess these programs that combine zoning and financial incentives, an analysis was conducted using aggregated data at the municipality level – from 34,924 municipalities across metropolitan France –, covering the period from 2005 to 2022 and based on the difference-in-differences quasi-experimental design for causal inference evaluation of public policy and intervention (Basu et al., 2017; Abadie et Cattanao, 2018). Based on this design we assume that the estimation of the causal impact measure's effect can be estimated by the difference between treated – e.g. municipalities eligible for financial incentives for GPs – and control municipalities without any incentives, before and after the policy intervention. We then assume that the trend of the outcome, here the GPs' density, is not different until the policy intervention (called the "treatment") was implemented, conditional on municipality characteristics.

Due to the nature of the policy and the way this policy was implemented, with multiple time periods (a municipality may be treated in 2008 or later) and two groups (treated or control municipalities), we estimate the impact through a specific difference-in-differences estimation strategy for "staggered" treatment and develop by Callaway and Sant'Anna.

The identification of the policy intervention or treatment was that a municipality beneficiated or treated with one or more of the zoning programs from ZRR (*Zone de revitalisation rurale*), ZMG (*Zonage Médecins généralistes*) or ZAFR (*Zones à finalité régionale*). Apart from being treated by one of the programs, a municipality must remain treated for the whole period once starts receiving treatment (Staggered Adoption). The municipalities that were never treated from 2005 until 2022 were chosen as the control group and municipalities having been treated from 2008 and onwards were included to make sure at least a municipality being treated staggered is untreated from 2005 until 2008.

The data was a secondary data received from the *Conseil National de l'Ordre des Médecins* (CNOM) and from the National Health Insurance (*Système national des données de santé, SNDS)*. The quasi-experimental design was implemented using R statistical and programming language (version 4.4.0 2024-04-24) and specifically the DID package.

The variables on which data was collected for each municipality were the *total number of GPs, the number of GPs under 40 years, the population size, the number of MSPs (maisons de santé pluriprofessionnelles), the level of equipment, ZAFR, ZRR,* and *ZMG treatment* status. Moreover,

the urban density variable, which classifies municipalities as either *urban or rural*, and two outcome variables — *the density of total GPs* and *the density of GPs under 40* — were created. These outcome variables were derived by dividing *the number of total GPs* and *the number of GPs under 40* by the *population* of each municipality, respectively. Additionally, a variable named *cumulative treatment* was created and stored the status of a municipality whether it received at least one of the ZAFR, ZRR, or ZMG treatments. In case, a municipality received one of the treatments in any time period, *the cumulative treatment* variable would state the municipality as treated. Also, each municipality had a unique identification code. Three additional treatment variables were also created from the provided data which were *MSPs regardless of financial incentives, MSPs with cumulative financial incentives,* and *MSPs without cumulative financial incentives.* When a municipality had at least one MSP and received one or more of the financial treatments (ZAFR, ZMG, ZRR), it was considered treated by *MSP with cumulative financial incentive* otherwise untreated. When a municipality had 1 or more MSPs but did not receive any financial incentive was considered as treated by *MSPs without financial incentive.*

A total of six distinct datasets were created from the initial data using the Staggered Adoption method, with one dataset corresponding to each treatment variable: *cumulative treatment, ZAFR, ZMG, ZRR, MSPs regardless of financial incentive,* and *MSPs without financial incentive*. The sample size for *cumulative treatment* and *MSPs with financial incentives* was identical, as the sample size was selected in a staggered manner for both variables.

The eligibility criteria for municipalities to be included in all analyses required that a municipality remain treated in all subsequent periods after receiving treatment for the first time (Staggered Adoption). Municipalities that were never treated by any of the treatment variables served as controls in the respective analysis. Furthermore, to strengthen the analysis, municipalities that began receiving treatment in 2005, 2006, and 2007 were excluded to ensure there was a period during which these municipalities had not received any treatments. Additionally, municipalities treated in 2022 were excluded from the analysis because 2022 was the final year for which data was provided, and there was no available comparison group.

While analyzing *cumulative treatment* (treated with ZAFR and/or ZRR and/or ZMG), a comprehensive selection process was undertaken to identify municipalities suitable for inclusion based on their treatment histories from 2005 to 2022. A total of 34,924 municipalities were initially considered, from which 5,072 (14.5%) municipalities were excluded due to receiving reversed treatment across 69 distinct patterns during the study period. Additionally, 9,323 (26.7%)

municipalities were excluded as they consistently received treatment throughout the entire timeframe. A further 39 (0.1%) municipalities were not included as they exclusively received treatment starting from 2006 onwards and did not meet inclusion criteria. 2,241 municipalities were excluded because they started being treated in 2022. Conversely, 2,212 (6.3%) municipalities that were never treated were designated as the control group for analysis. Ultimately,16,015 (52.3%) municipalities that received staggered treatment constituted the primary cohort for the study. This rigorous categorization ensured a robust framework for examining the impacts of treatment variations on outcomes across a diverse array of municipalities. 9 municipalities were integrated with other municipalities and did not have information on population and GP numbers; thus, they were excluded, too.

The eligibility criteria described earlier were considered for all other treatment variables, too. Thus, while analyzing *ZAFR* as a treatment variable, 34,076 municipalities were included in the analysis from the initial 34,924 municipalities. 29,071 (83.2%) municipalities were never treated for *ZAFR,* and they were considered as controls while 5,005 (14.3%) municipalities received *ZAFR* as staggered treatment throughout the time period of 2005-2022. A total of 848 (2.4%) municipalities were excluded from the analysis according to exclusion criteria.

For the analysis of *ZMG* treatment, 33,874 (96.9%) municipalities of all municipalities fulfilled the required eligibility criteria, and they were included in the analyses. 3,250 (9.3%) municipalities were never treated and served as controls whilst 26,418 (75.6%) received the *ZMG* treatment by the criteria described. 4,117 (11.7%) municipalities treated in 2022, a total of 89 municipalities beginning treatment in 2008, 2009, 2010, and 2011 were considered as small groups, and 1,050 (3%) other municipalities which did not meet the requirements were excluded from the analysis.

17 municipalities treated in 2022, and 13,529 (38.7%) municipalities were excluded from the analysis for not being treated in a staggered manner when *ZRR* treatment was evaluated. 17,002 (48.6%) municipalities were never treated for *ZRR;* thus, they were included as controls in *ZRR treatment* analyses. 4,376 (12.5%) municipalities were included as treated staggered observations.

While analyzing the effect of *MSPs regardless of cumulative financial incentive* as treatment in the municipalities, initially 34,369 (98.4%) municipalities from a total of 34,924 were selected. However, 9 municipalities started receiving treatment in 2008, 11 municipalities in 2009, and finally 28 municipalities that started receiving treatment in 2010 were excluded due to being

considered small groups for the analyses. In addition, 206 municipalities were excluded since they started receiving treatment in 2022. A total of 1,282 (3.6%) municipalities that were treated in a staggered manner and 32,833 (94%) municipalities that were never treated for *MSPs* (those municipalities did not have at least 1 MSP) were selected as a control group.

The initial sample size for municipalities treated with *MSPs with cumulative financial incentives* and *cumulative treatment financial incentive* variables was identical, comprising 20,468 (70%) out of 34,924 municipalities. However, 238 municipalities that received *MSPs with financial incentives* treatment for the first time in 2022 were excluded. Additionally, 6 municipalities that began treatment in 2008, 3 municipalities in 2009, and 12 municipalities in 2010 were also excluded from the analyses, as they were considered very small in size groups to run the estimates. In total, 14,715 (42.1%) municipalities were excluded for not meeting the required eligibility criteria. Of the remaining municipalities, 19,258 (55.1%) were never treated and were included as controls in the analyses. Finally, 951 (2.7%) municipalities that were treated in a staggered manner across different years were included in the analyses as treated observations.

In order to do a robustness check and evaluate the impact of MSPs on the installation and retention of GPs under 40 years old, a variable called *MSPs without financial incentives* was created and considered as a treatment variable. Municipalities that had at least 1 MSP and did not receive any financial incentives were considered as treated otherwise untreated. To evaluate the effects of this particular treatment variable, initially 34,369 (98.4%) municipalities were selected. 58 municipalities began treatment in 2022, consequently, they were excluded. Moreover, 1 municipality in 2008, 4 in 2010, and 2 municipalities that began treatment in 2011 were also excluded from analyses as they were very small groups. Overall, 620 (1.7%) municipalities did not meet the eligibility criteria and were excluded from analyses. 34,124 (97.7%) municipalities that were never treated were assigned as controls. 180 (0.5%) municipalities that were treated in a staggered manner across years were included as treated municipalities in the analyses.

The causal effect estimation was done through difference-in-differences with multiple time periods and using staggered treatment adoption assumption.

Results

Yearly distribution of *cumulative financial incentive/treatment (ZAFR and/or ZRR and/or ZMG)* across municipalities indicates that the number of treated municipalities gradually increased from 2008 until 2022 except for the years 2012 and 2018 where the number of treated municipalities gets doubled compared to previous years relatively.

	Yearly Distribution of Cumulative Financial Incentives/Treatment (e.g ZAFR and/or ZRR and/or ZMG) across Municipalities		
	Untreated	Treated	Total
Year			
2005	20,468 (100%)	0 (0%)	20,468 (100%)
2006	20,468 (100%)	0 (0%)	20,468 (100%)
2007	20,468 (100%)	0 (0%)	20,468 (100%)
2008	18,125 (89%)	2,343 (11%)	20,468 (100%)
2009	18,125 (89%)	2,343 (11%)	20,468 (100%)
2010	17,953 (88%)	2,515 (12%)	20,468 (100%)
2011	17,951 (88%)	2,517 (12%)	20,468 (100%)
2012	16,049 (78%)	4,419 (22%)	20,468 (100%)
2013	15,652 (76%)	4,816 (24%)	20,468 (100%)
2014	14,638 (72%)	5,830 (28%)	20,468 (100%)
2015	14,638 (72%)	5,830 (28%)	20,468 (100%)
2016	14,638 (72%)	5,830 (28%)	20,468 (100%)
2017	12,442 (61%)	8,026 (39%)	20,468 (100%)
2018	4,453 (22%)	16,015 (78%)	20,468 (100%)
2019	4,453 (22%)	16,015 (78%)	20,468 (100%)
2020	4,453 (22%)	16,015 (78%)	20,468 (100%)
2021	4,453 (22%)	16,015 (78%)	20,468 (100%)
2022	2,212 (11%)	18,256 (89%)	20,468 (100%)

Table 1: Cumulative Treatment counts for ZAFR and/or ZRR and/or ZMG.

The data shows the number of municipalities treated in a staggered manner with *ZAFR* and *ZRR* increases progressively, and it reaches 5,005 (14.3%) and 4,393 (12.5%) in 2022 respectively. However, the number of municipalities treated with *ZMG incentives* increased sharply in 2018 to 26,507 (75.8%) from 4,121 (11.7%) in 2017 and it reached 30,624 (87.6%) in 2022 (see appendices for table).

	Yearly Distribution of ZAFR Financial Incentive/Treatment across Municipalities		
	0	1	Total
Year			
2005	34,076 (100%)	0 (0%)	34,076 (100%)
2006	34,076 (100%)	0 (0%)	34,076 (100%)
2007	34,076 (100%)	0 (0%)	34,076 (100%)
2008	30,854 (91%)	3,222 (9.5%)	34,076 (100%)
2009	30,854 (91%)	3,222 (9.5%)	34,076 (100%)
2010	30,854 (91%)	3,222 (9.5%)	34,076 (100%)
2011	30,854 (91%)	3,222 (9.5%)	34,076 (100%)
2012	30,854 (91%)	3,222 (9.5%)	34,076 (100%)
2013	30,854 (91%)	3,222 (9.5%)	34,076 (100%)
2014	29,071 (85%)	5,005 (15%)	34,076 (100%)
2015	29,071 (85%)	5,005 (15%)	34,076 (100%)
2016	29,071 (85%)	5,005 (15%)	34,076 (100%)
2017	29,071 (85%)	5,005 (15%)	34,076 (100%)
2018	29,071 (85%)	5,005 (15%)	34,076 (100%)
2019	29,071 (85%)	5,005 (15%)	34,076 (100%)
2020	29,071 (85%)	5,005 (15%)	34,076 (100%)
2021	29,071 (85%)	5,005 (15%)	34,076 (100%)
2022	29,071 (85%)	5,005 (15%)	34,076 (100%)

Table 2: This table shows the number of treated and untreated municipalities with ZAFR financial incentives.

	Yearly Distribution of ZRR Financial Incentive/Treatement across Municipalities		
	0	1	Total
Year			
2005	21,395 (100%)	0 (0%)	21,395 (100%)
2006	21,395 (100%)	0 (0%)	21,395 (100%)
2007	21,395 (100%)	0 (0%)	21,395 (100%)
2008	21,395 (100%)	0 (0%)	21,395 (100%)
2009	21,395 (100%)	0 (0%)	21,395 (100%)
2010	21,231 (99%)	164 (0.8%)	21,395 (100%)
2011	21,231 (99%)	164 (0.8%)	21,395 (100%)
2012	21,231 (99%)	164 (0.8%)	21,395 (100%)
2013	20,630 (96%)	765 (3.6%)	21,395 (100%)
2014	20,497 (96%)	898 (4.2%)	21,395 (100%)
2015	20,497 (96%)	898 (4.2%)	21,395 (100%)
2016	20,497 (96%)	898 (4.2%)	21,395 (100%)
2017	17,031 (80%)	4,364 (20%)	21,395 (100%)
2018	17,019 (80%)	4,376 (20%)	21,395 (100%)
2019	17,019 (80%)	4,376 (20%)	21,395 (100%)
2020	17,019 (80%)	4,376 (20%)	21,395 (100%)
2021	17,019 (80%)	4,376 (20%)	21,395 (100%)
2022	17,002 (79%)	4,393 (21%)	21,395 (100%)

Table 3: This table describes ZRR treatment status across municipalities from 2005 to 2022.

The data shows that the number of municipalities with 1 or more MSPs has persistently increased from 9 municipalities in 2008 to 1,536 municipalities in 2022 (additional details in appendices).

In the analyses of *cumulative financial incentives* (*ZAFR* and/or *ZMG* and/or *ZRR*) as treatment variable, population density (large cities = 1 and rural and peri-urban areas = 0) and number of MSPs (municipalities without MSP = 0 and municipalities with 1 or more MSPs = 1) are used as covariates. The *cumulative financial incentives* indicate a significant negative impact in the analyses (aggregated average treatment for the treated, ATT = -3.086, standard error, SE = 0.469, and 95% confidence intervals, CI, comprise between -4.006, -2.166 in simple aggregation method). The analyses show a significant negative impact in the dynamic aggregation method until 10 years after initiation of the treatment, too. In group/year treatment analysis, 6 different groups of municipalities were included in the analysis.

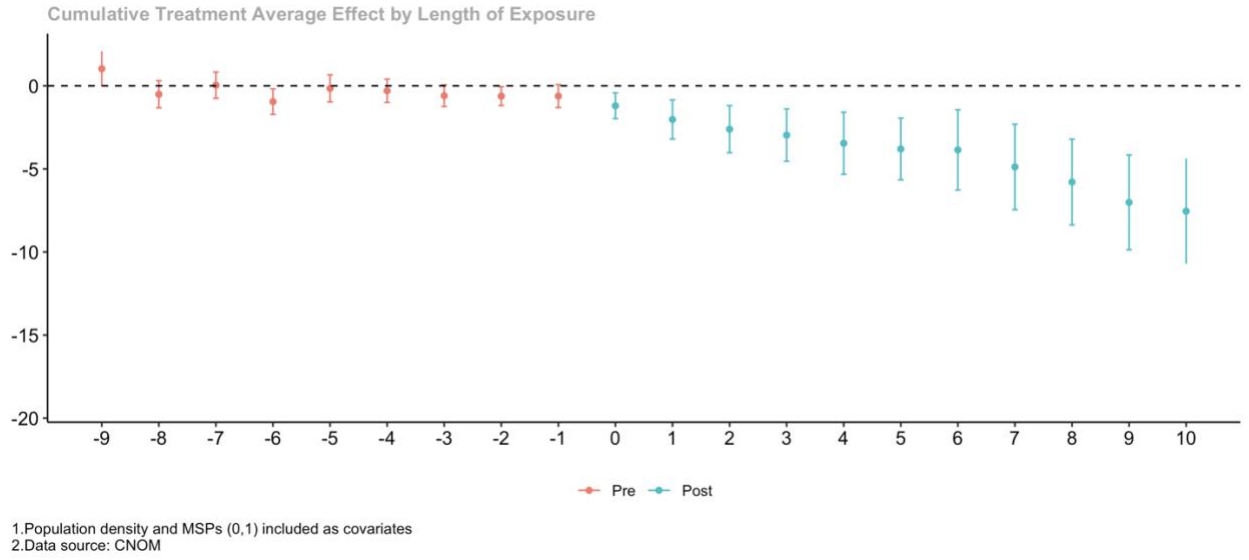


Figure 1: This plot shows the aggregated ATT of cumulative financial incentives in the dynamic method.

Treatment Starting Year	N of Municipalities	Aggregated ATT	Standard Error	95% CI	
2010	172	-7.494	4.129	-17.535	2.545
2012	1902	-3.225	0.673	-4.862	1.587 *
2013	397	-2.990	1.150	-5.788	-0.193 *
2014	1014	-2.157	0.841	-4.204	-0.110 *
2017	2196	-3.216	0.675	-4.859	-1.572 *
2018	7896	-2.946	0.530	-4.235	-1.657 *

Table 4: This table represents the different municipality groups according to their first year of treatment for cumulative financial incentives.

In Table 4, it can be seen that apart from the group of municipalities that began treatment in 2010, all other groups have a significant negative impact on the installation and retention of GPs under 40 years of age. However, the negative impact of the analyses cannot be related to the financial incentives. It can be interpreted that the *cumulative financial incentives* are not sufficiently balancing or responding to the outflow of GPs from rural and peri-urban areas.

ZAFR financial incentive/treatment analysis suggests that it has no significant impact on the installation of new GPs and the retention of the GPs across the municipalities as shown in Figure 2. There are two groups of municipalities, 2008 and 2014, according to their first-time treatment exposure, and ZAFR incentive has no significant impact on them either (see appendices). The aggregated ATT for municipalities receiving the treatment for the first time in 2008 is -0.666 [SE = 0.438, 95% CI -1.643, 0.311] and for the group of municipalities receiving the treatment for the first time in 2014 is -0.161 [SE = 0.539, 95%CI -1.364, 1.041]. Population density, levels of equipment, and MSPs (0,1) across municipalities were included as covariates for the effect estimation of *ZAFR.*

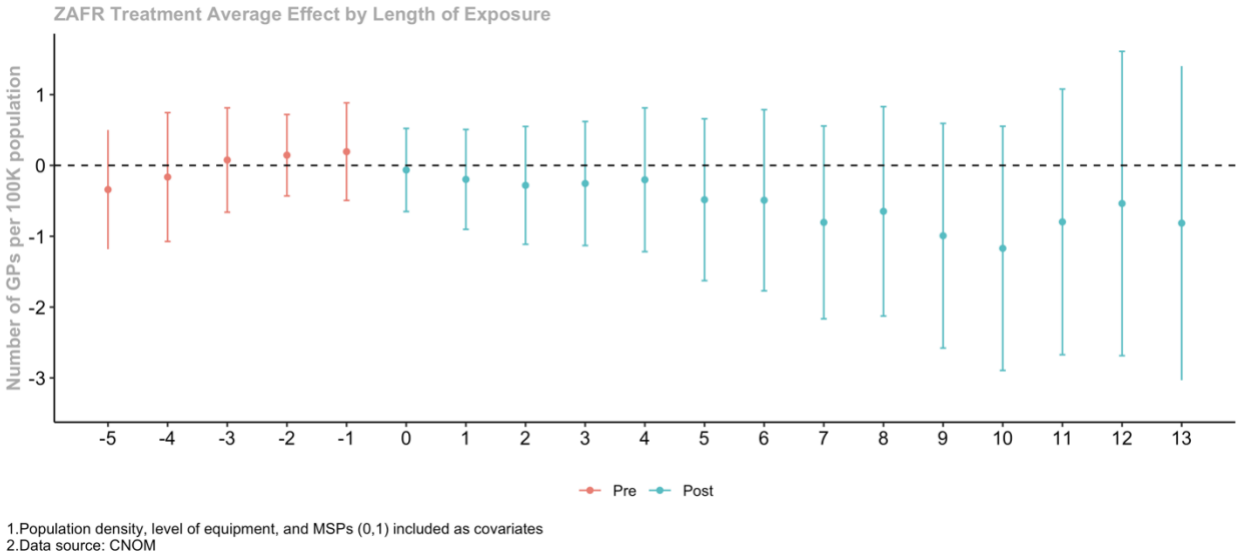


Figure 2: This plot represents aggregated ATT of ZAFR financial incentives across municipalities in a dynamic method.

While analyzing the data for ZRR, it is found that these incentives neither have a significant impact on the installation of new GPs nor the retention of GPs like the ZAFR incentive. The aggregated ATT for ZRR in the simple method is ATT = -0.008 [SE = 0.378, 95% CI -0.749, 0.732]. When analyzed by group-specific effects, the group that was first treated in 2018 showed significant negative impact [ATT= -3.258, SE= 1.304, 95%CI -6.232, -0.285]. However, the sample size for

the group of 2018 is 12 municipalities which is considered very low in this context. Similarly, population density, levels of equipment, and MSPs (0,1) across municipalities were included as covariates for the effect estimation of *ZRR.*

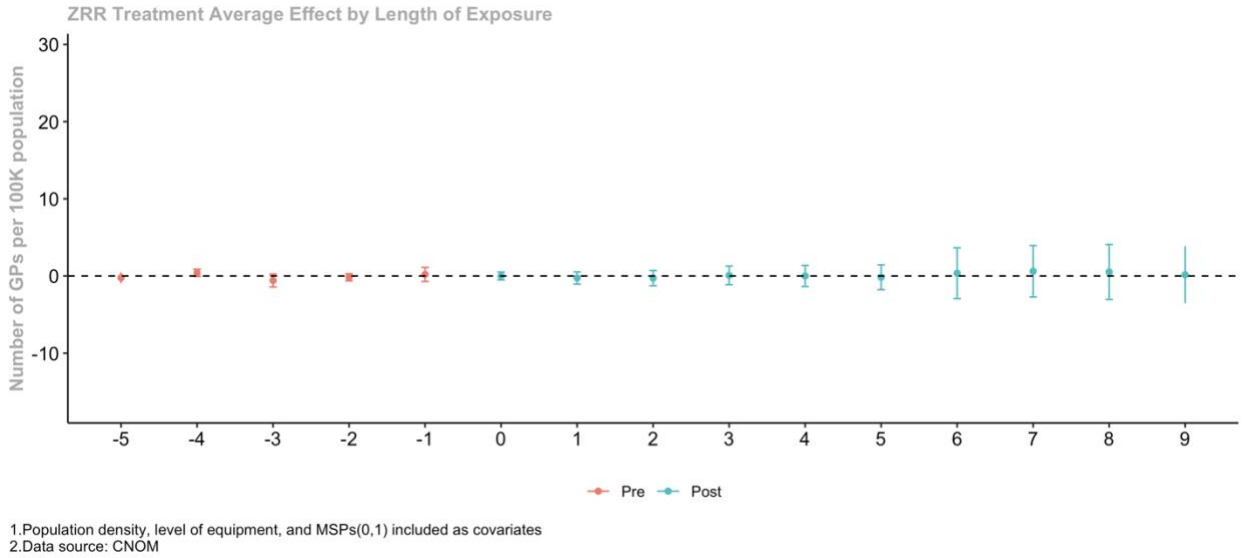


Figure 3: This plot shows the aggregated ATT of ZRR financial incentives across municipalities in a dynamic method.

The aggregate of group-time average treatment effect on treated (ATT) across different lengths of exposure (dynamic method) *vs.* aggregate of different time periods (calendar time method) are slightly different for ZMG treatment as shown in *Figures 4* and *5*. Nonetheless, they both follow almost similar trends for some time. The aggregated ATT for *ZMG financial incentives* in the simple method is significant [ATT = -0.739, SE = 0.355, 95%CI -1.435, -0.043] but the confidence interval is very close to null. In group-specific analysis, there are two different groups, one starting the treatment in 2012 (4,032 municipalities) and the other in 2018 (22,386 municipalities). Group-specific effect estimates for *ZMG financial incentives* indicate a significant negative impact for the group of municipalities first treated in 2018.

Treatment Starting Year	N of Municipalities	Aggregated ATT	Standard Error	95% CI	
2012	4,032	0.495	0.516	-0.670	1.661
2018	22,386	-1.228	0.395	-2.121	-0.336 *

Table 5: This table represents the different municipality groups according to their first year of treatment for ZMG financial incentives.

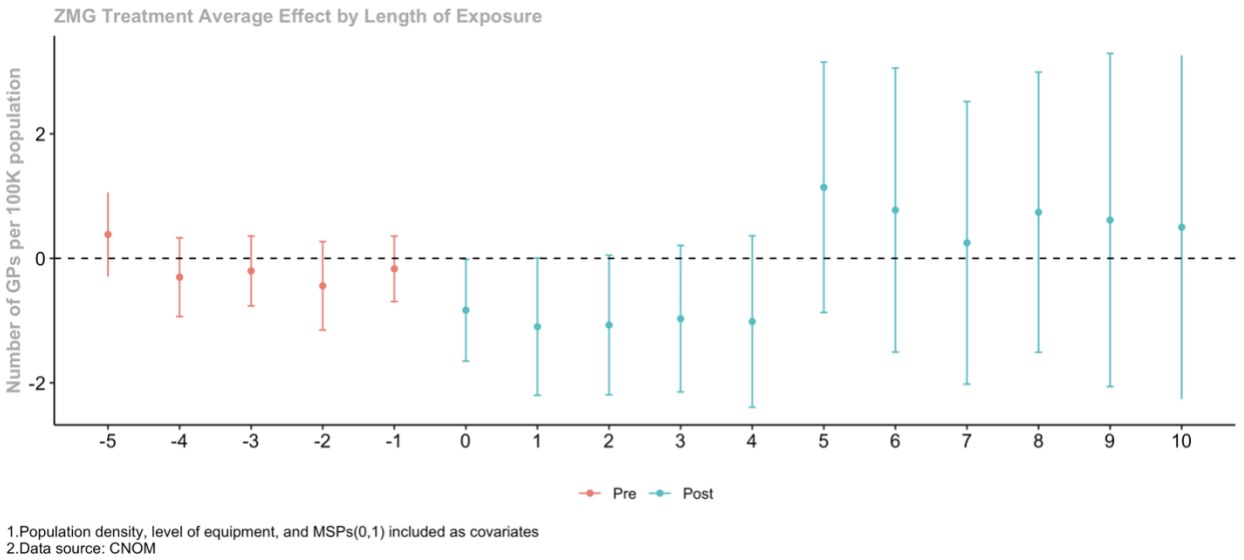


Figure 4: Aggregated ATT of ZMG financial incentive in dynamic method

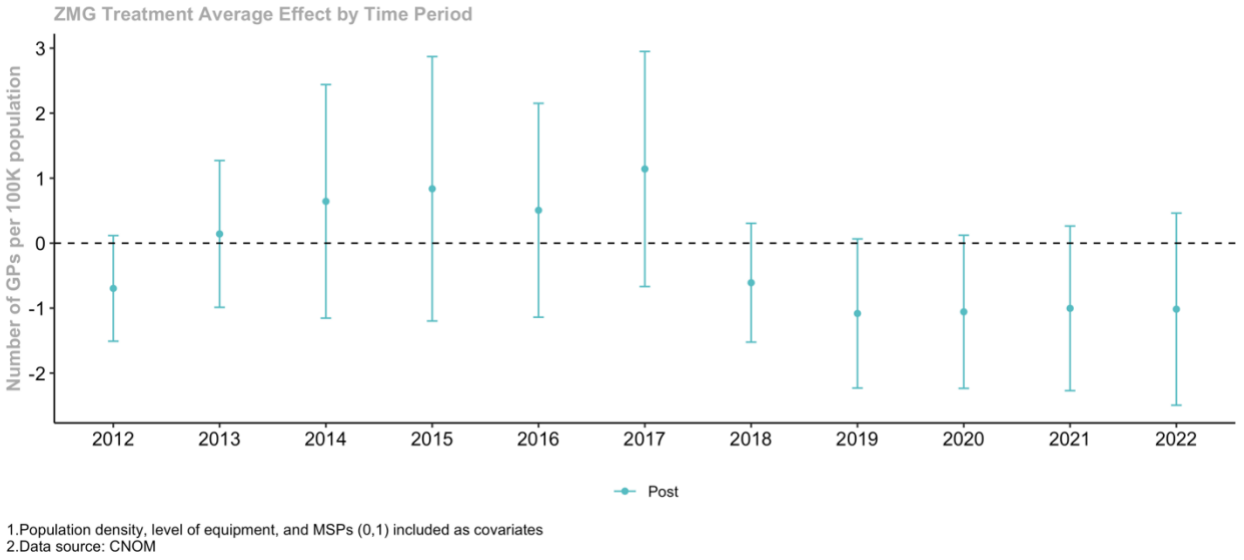
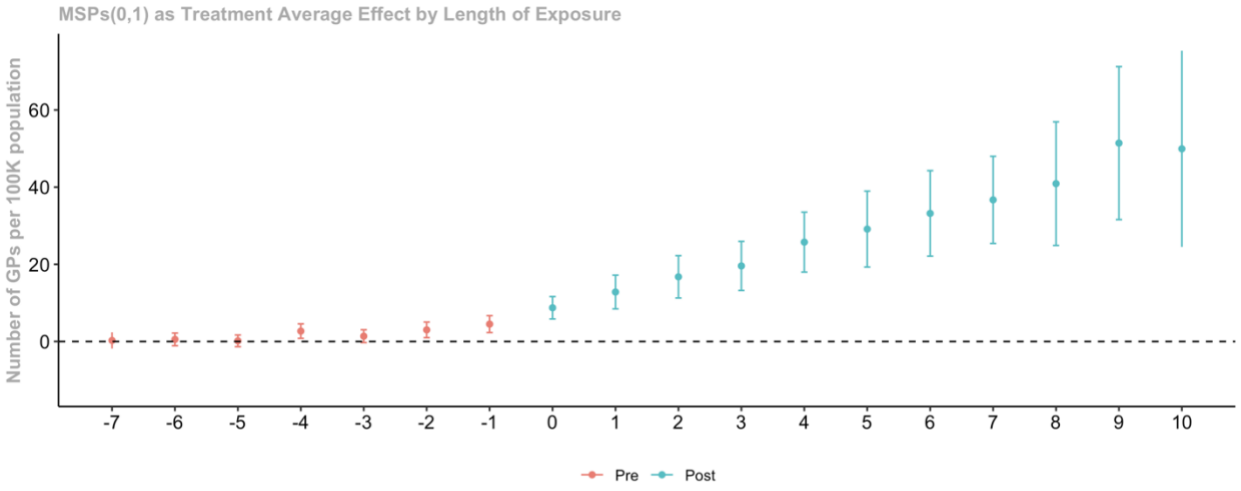


Figure 5: Aggregated ATT of ZMG financial incentives in calendar time method

Overall, *ZAFR* and *ZRR* incentives do not have any significant impact on the installation of the new GPs and the retention of the GPs in desired municipalities. On the contrary, *cumulative financial incentives* and group of municipalities treated in 2018 (N = 22,386) for *ZMG incentive* has unexpected significant negative effects on the installation and the retention of the GPs which can be interpreted as insufficient measures to address the ongoing outflow of the GPs under 40 years of age from rural and peri-urban areas.

A previous study performed by (Mousquès et Chevilliard,.2021) suggests that MSPs (maisons de santé pluriprofessionnelles) or Primary Care Teams (PCTs) have a significant positive impact on the installation and the retention of GPs across municipalities. In order to compare, explore, and identify the true factor that possibly has a positive impact on the installation and the retention of GPs, MSPs were analyzed as a treatment variable, too. The findings of the analysis are in line with the findings of (Mousquès et Chevilliard,.2021) and municipalities that had 1 or more MSPs (maisons de santé pluriprofessionnelles) had the aggregated ATT = 22.066 [SE = 1.947, 95% CI 18.248, 25.884] in simple aggregation method. In other words, on average municipalities that had 1 or more MSPs, had 22 more GPs per 100,000 population compared to the municipalities that do not have MSPs. The effect of the MSPs can be seen from the first year of treatment and increases steadily each year as shown in *Figure 6*.



1.Population density, level of equipment and cumulative treatment (ZAFR and/or ZRR and/or ZMG) included as covariates.
2.Municipalities with number of MSPs equal or more than 1 counted as treated and zero as untreated
3.Data source: CNOM

Figure 6: Aggregated ATT of MSPs regardless of financial incentive as treatment variable in a dynamic method

Discussion

As discussed in the results section, *ZAFR,* and *ZRR financial incentives* do not have any significant impact on the installation and retention of GPs under 40, but the analyses show a significant negative impact for *cumulative financial incentives* and group of municipalities treated in 2018 (N= 22,386) for *ZMG* which can be interpreted as the insufficient impact of treatments to tackle the outflow of GPs from desired municipalities.

In group-specific analysis of *MSPs regardless of financial incentives*, there are 11 different groups of municipalities according to the first year of treatment in the analysis, with the lowest group year in size 2011 (N = 35) and the highest number of municipalities in the group year 2021 (N = 163). It is to mention these are the numbers of municipalities starting for the first time in those years not the total number of municipalities receiving the treatment in a staggered manner in those years. All the groups show highly significant positive effect estimation on the installation and retention of GPs under 40. The current analysis was performed on population density, level of equipment, and *cumulative financial incentive* included as covariates and the results were similarly highly significant when *cumulative financial incentives* were removed from being covariate (details in appendices).

To ensure the reliability and validity of the findings regarding the highly significant impact of *MSPs* across municipalities, two other variables, *MSP with financial*, and *MSP without financial incentive* were created and assessed as treatment variables.

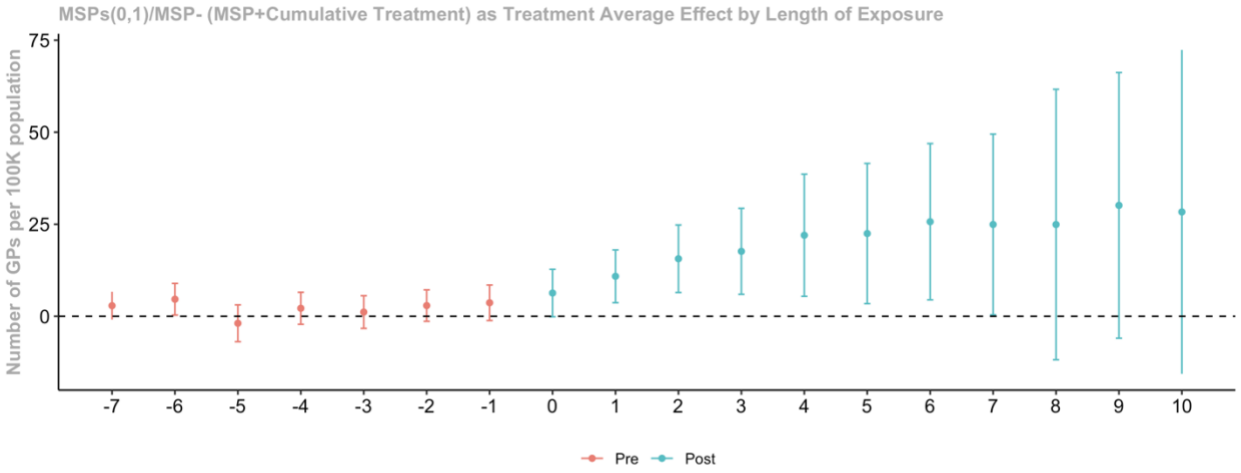
The effect estimation of *MSPs with financial incentives* as treatment and population density and level of equipment included as covariates in the analysis showed aggregated ATT = 11.541 [SE = 1.493, 95%CI 8.614, 14.46] in the simple aggregation method. It means that on average municipalities that have at least 1 MSP (*maisons de santé pluriprofessionnelles)* and have received *cumulative financial incentives* (*ZAFR* and/or *ZMG* and/or *ZRR*) host 11.5 more GPs per 100,000 population compared to municipalities that do not have any MSPs and have not benefited from *cumulative financial incentives.* Furthermore, the impact of *MSPs with cumulative financial incentives* as a treatment increases progressively in the dynamic analysis method as shown in *Figure 7.*

In order to further support the initial findings of the study that *MSPs* have a highly significant positive impact on the installation and retention of GPs under 40 in rural and peri-urban areas,

MSPs without cumulative financial incentives variable was also assessed as treatment variable and population density and level of equipment variables were accounted as covariates. The analysis for *MSPs without cumulative financial incentives* (MSP = 1 and *cumulative financial incentive = 0,* counted as treated otherwise untreated) reveals a highly significant positive impact as well [ATT = 16.201, SE = 3.432, 95%CI 9.473, 22.928].

1.Population density and level of equipment included as covariates
2.Municipalities with number of MSPs equal or more than 1 and treated by either of ZAFR,ZRR,or ZMG counted as treated otherwise as untreated
3.Data source: CNOM

Figure 7: Aggregated ATT of MSPs with cumulative financial incentives in a dynamic method



1.Population density and level of equipment included as covariates
2.Municipalities with number of MSPs equal or more than 1 counted as treated otherwise as untreated
3.The sample size does not include municipalities treated for MSP and Cumulative Treatment simultaneously
4.Data source: CNOM

Figure 8: This plot shows the aggregated ATT of MSPs without cumulative financial incentives in the dynamic method.

Since the numbers of municipalities that have been treated for 8, 9, and 10 years for *MSPs without financial incentives* were low, the effect becomes insignificant in the analysis as shown in *Figure 8.*

While the effect estimations for *ZAFR* and *ZRR financial incentives were insignificant, cumulative financial incentives* and the group of municipalities treated in 2018 for *ZMG* demonstrated a significant negative impact. However, municipalities that had at least 1 MSP indicated a strongly positive influence on the installation and retention of the GPs under 40. The robustness check where *MSPs with financial incentives* variable as treatment and *MSPs without financial incentives* variable were created and evaluated also represented extremely significant positive effects as in lined with the effects of *MSPs regardless of cumulative financial incentives* variable. It can be interpreted that the highly significant positive impact is due to the *MSPs* as long as the *cumulative financial incentive, ZAFR, ZRR,* and *ZMG* incentives do not have a positive impact solely.

The limitation of this study can be the sample size for *MSPs without financial incentives* as it is a relatively smaller treated sample size compared to other treatments. In addition, the study and analyses are conducted on municipality-level data but not on individual-level data which can be addressed as limitations.

Conclusion/Recommendation/Implication

The results and findings of this study show that *ZAFR, ZMG,* and *ZRR* zonings and financial incentives do not effectively address the unequal distribution of GPs in urban and rural areas around France. The insignificant impact of *ZAFR, ZMG,* and *ZRR* can be interpreted as the number of outflows compared to the installation and the retention of GPs under 40 years old is quite high in rural and peri-urban areas.

Nonetheless, the study reveals that municipalities that had at least one MSP (*maisons de santé pluriprofessionnelles)* regardless of their zoning financial incentive status had 22 more GPs under 40 years old per 100,000 of the population compared to municipalities that did not have any MSPs. Additionally, *MSPs with cumulative financial incentives* (municipalities that had at least one maisons *de santé pluriprofessionnelles* and had received at least one of the zoning financial incentives, *ZAFR* and/or *ZMG* and/or *ZRR*) had 11.5 more GPs under 40 years old compared to municipalities that do not have at least one MSP and one of the financial incentives. Municipalities that were treated only for MSPs and had at least one MSP but did not receive any financial incentive (*MSPs without cumulative financial incentives*) had 16 more GPs under 40 years old per 100,000 population compared to municipalities that had MSPs and were treated for financial incentives, municipalities that did not have MSPs and treated for financial incentives, and municipalities that did not have MSPs and were not treated for financial incentives. The findings of this study are in line with the results of the study conducted by (Chevillard and Mousquès, 2021). Moreover, (McIsaac et al,. 2019) results reveal that established GPs are not very mobile, even when a financial incentive is offered.

Considering the findings of this study and existing literature regarding *MSPs* (Primary Care Teams), it is recommended that promoting professional life support and adjustments such as ensuring more group practices can significantly reduce the imbalanced distribution of GPs across municipalities.

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List of Appendices

Figures and Tables:

	Yearly Distribution of ZMG Financial Incentive/Treatment across Municipalities		
	0	1	Total
Year			
2005	33,874 (100%)	0 (0%)	33,874 (100%)
2006	33,874 (100%)	0 (0%)	33,874 (100%)
2007	33,874 (100%)	0 (0%)	33,874 (100%)
2008	33,805 (100%)	69 (0.2%)	33,874 (100%)
2009	33,799 (100%)	75 (0.2%)	33,874 (100%)
2010	33,792 (100%)	82 (0.2%)	33,874 (100%)
2011	33,785 (100%)	89 (0.3%)	33,874 (100%)
2012	29,753 (88%)	4,121 (12%)	33,874 (100%)
2013	29,753 (88%)	4,121 (12%)	33,874 (100%)
2014	29,753 (88%)	4,121 (12%)	33,874 (100%)
2015	29,753 (88%)	4,121 (12%)	33,874 (100%)
2016	29,753 (88%)	4,121 (12%)	33,874 (100%)
2017	29,753 (88%)	4,121 (12%)	33,874 (100%)
2018	7,367 (22%)	26,507 (78%)	33,874 (100%)
2019	7,367 (22%)	26,507 (78%)	33,874 (100%)
2020	7,367 (22%)	26,507 (78%)	33,874 (100%)
2021	7,367 (22%)	26,507 (78%)	33,874 (100%)
2022	3,250 (9.6%)	30,624 (90%)	33,874 (100%)

Table 6: This table shows the number of treated and untreated municipalities with ZMG financial incentives.

	Yearly Distribution of MSPs across Municipalities		
	0	1	Total
Year			
2005	34,369 (100%)	0 (0%)	34,369 (100%)
2006	34,369 (100%)	0 (0%)	34,369 (100%)
2007	34,369 (100%)	0 (0%)	34,369 (100%)
2008	34,360 (100%)	9 (<0.1%)	34,369 (100%)
2009	34,349 (100%)	20 (<0.1%)	34,369 (100%)
2010	34,321 (100%)	48 (0.1%)	34,369 (100%)
2011	34,286 (100%)	83 (0.2%)	34,369 (100%)
2012	34,224 (100%)	145 (0.4%)	34,369 (100%)
2013	34,139 (99%)	230 (0.7%)	34,369 (100%)
2014	34,021 (99%)	348 (1.0%)	34,369 (100%)
2015	33,918 (99%)	451 (1.3%)	34,369 (100%)
2016	33,839 (98%)	530 (1.5%)	34,369 (100%)
2017	33,742 (98%)	627 (1.8%)	34,369 (100%)
2018	33,587 (98%)	782 (2.3%)	34,369 (100%)
2019	33,376 (97%)	993 (2.9%)	34,369 (100%)
2020	33,202 (97%)	1,167 (3.4%)	34,369 (100%)
2021	33,039 (96%)	1,330 (3.9%)	34,369 (100%)
2022	32,833 (96%)	1,536 (4.5%)	34,369 (100%)

Table 7: This table shows the number of treated and untreated municipalities with MSPs regardless of financial incentives.

Yearly Distribution of MSPs and Cumulative Treatment across Municipalities			
	0	1	Total
Year			
2005	20,468 (100%)	0 (0%)	20,468 (100%)
2006	20,468 (100%)	0 (0%)	20,468 (100%)
2007	20,468 (100%)	0 (0%)	20,468 (100%)
2008	20,462 (100%)	6 (<0.1%)	20,468 (100%)
2009	20,459 (100%)	9 (<0.1%)	20,468 (100%)
2010	20,447 (100%)	21 (0.1%)	20,468 (100%)
2011	20,433 (100%)	35 (0.2%)	20,468 (100%)
2012	20,405 (100%)	63 (0.3%)	20,468 (100%)
2013	20,360 (99%)	108 (0.5%)	20,468 (100%)
2014	20,296 (99%)	172 (0.8%)	20,468 (100%)
2015	20,243 (99%)	225 (1.1%)	20,468 (100%)
2016	20,197 (99%)	271 (1.3%)	20,468 (100%)
2017	20,115 (98%)	353 (1.7%)	20,468 (100%)
2018	19,846 (97%)	622 (3.0%)	20,468 (100%)
2019	19,716 (96%)	752 (3.7%)	20,468 (100%)
2020	19,610 (96%)	858 (4.2%)	20,468 (100%)
2021	19,496 (95%)	972 (4.7%)	20,468 (100%)
2022	19,258 (94%)	1,210 (5.9%)	20,468 (100%)

Table 8: This table shows the number of treated and untreated municipalities with MSPs with of financial incentives variable.

	Yearly Distribution of MSP-(MSP+Cumulative Treatment) across Municipalities		
	0	1	Total
Year			
2005	34,369 (100%)	0 (0%)	34,369 (100%)
2006	34,369 (100%)	0 (0%)	34,369 (100%)
2007	34,369 (100%)	0 (0%)	34,369 (100%)
2008	34,368 (100%)	1 (<0.1%)	34,369 (100%)
2009	34,368 (100%)	1 (<0.1%)	34,369 (100%)
2010	34,364 (100%)	5 (<0.1%)	34,369 (100%)
2011	34,362 (100%)	7 (<0.1%)	34,369 (100%)
2012	34,350 (100%)	19 (<0.1%)	34,369 (100%)
2013	34,342 (100%)	27 (<0.1%)	34,369 (100%)
2014	34,331 (100%)	38 (0.1%)	34,369 (100%)
2015	34,317 (100%)	52 (0.2%)	34,369 (100%)
2016	34,302 (100%)	67 (0.2%)	34,369 (100%)
2017	34,289 (100%)	80 (0.2%)	34,369 (100%)
2018	34,269 (100%)	100 (0.3%)	34,369 (100%)
2019	34,245 (100%)	124 (0.4%)	34,369 (100%)
2020	34,210 (100%)	159 (0.5%)	34,369 (100%)
2021	34,182 (99%)	187 (0.5%)	34,369 (100%)
2022	34,124 (99%)	245 (0.7%)	34,369 (100%)

Table 9: This table shows the number of treated and untreated municipalities with MSPs without financial incentives.

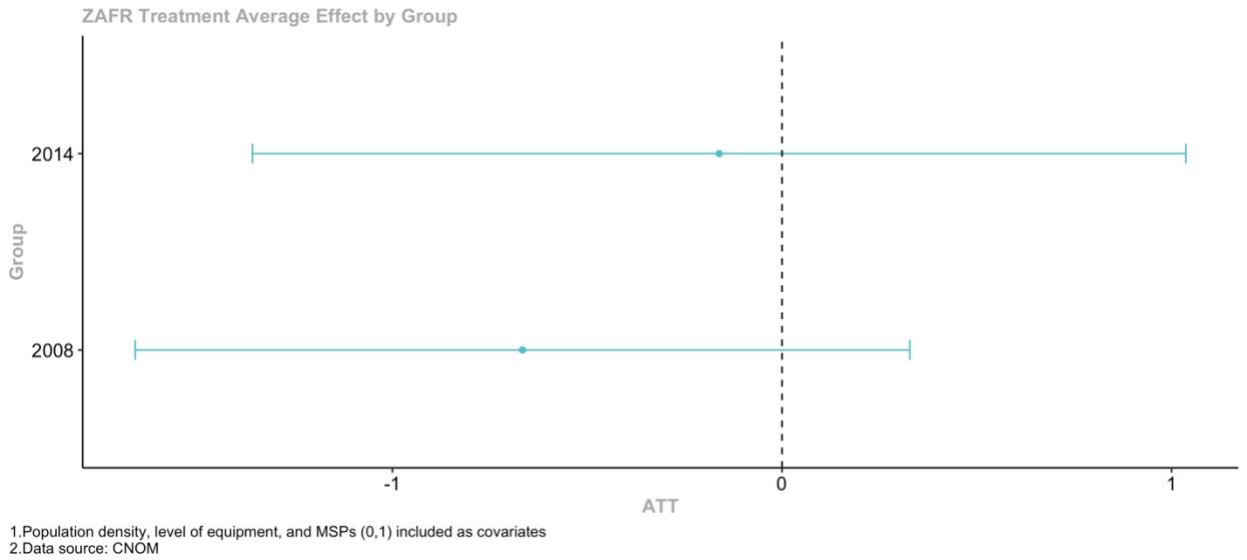


Figure 9: This plot shows the aggregated ATT of ZAFR financial incentive based on the group year method (municipalities treated for the first time in those years)

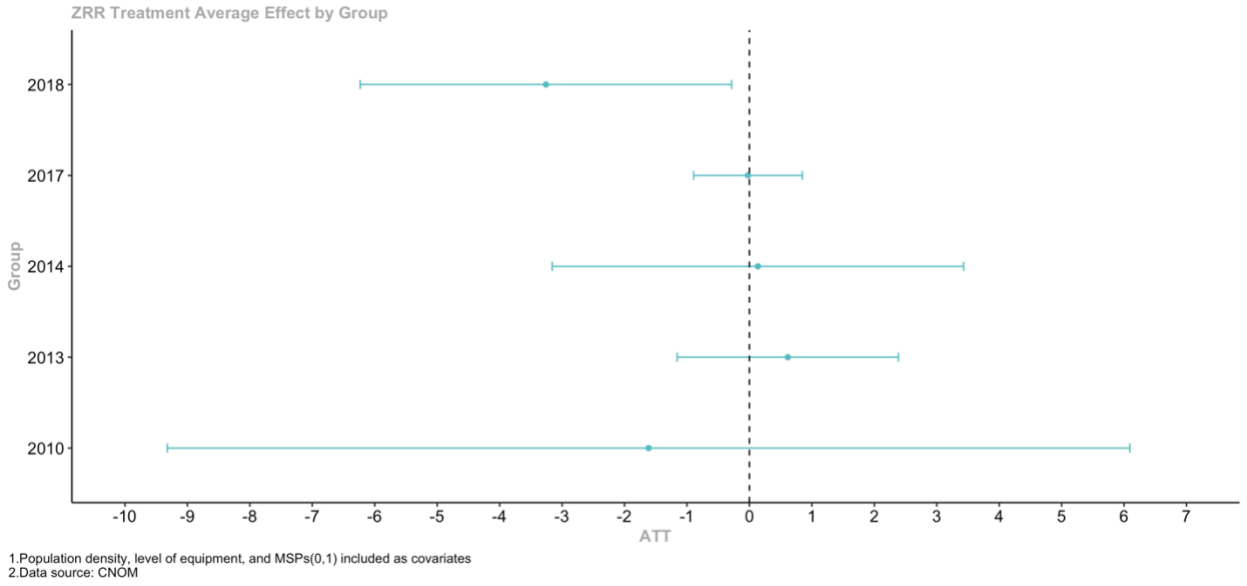
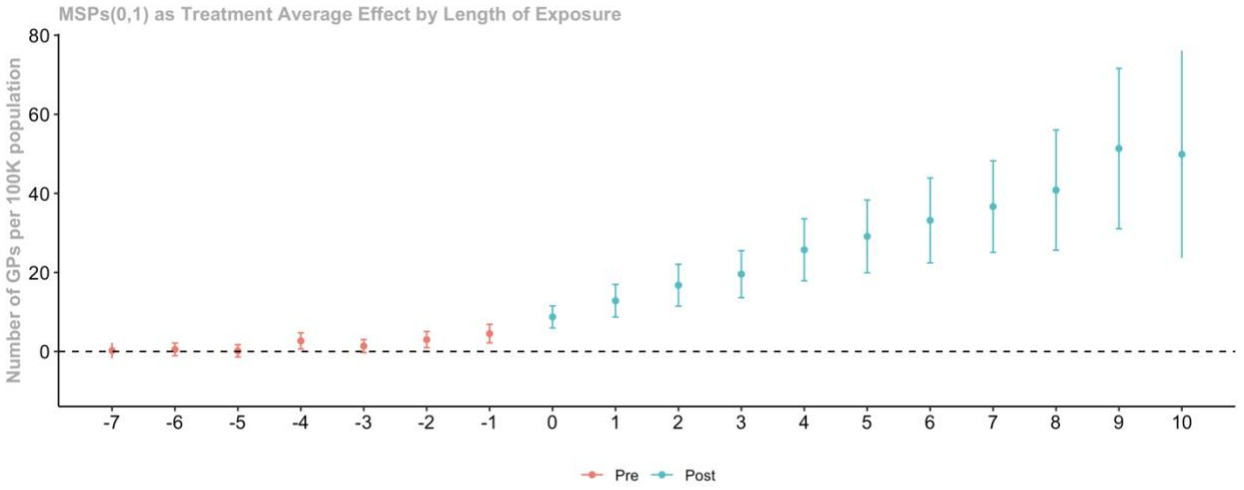
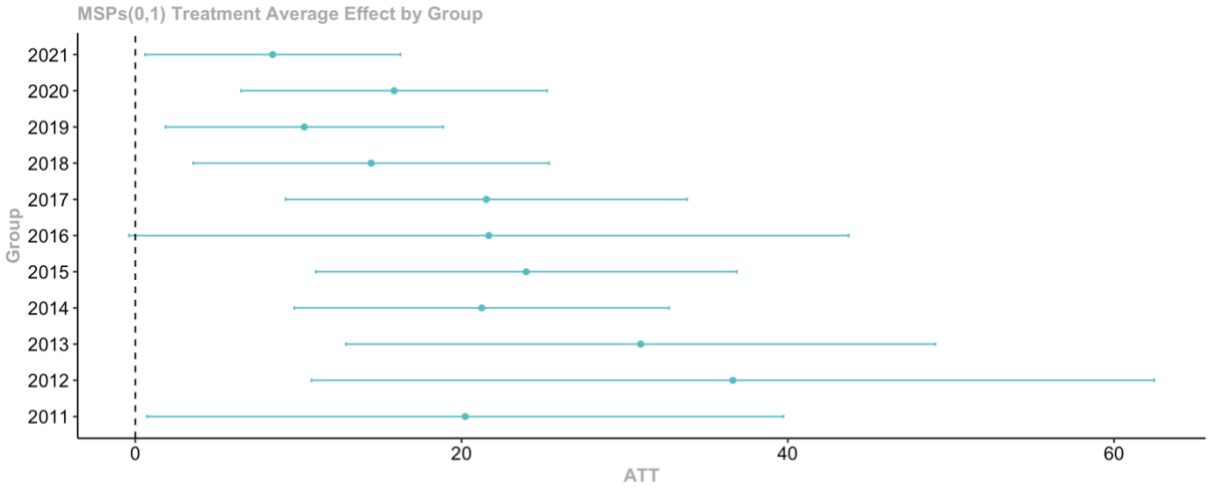


Figure 10: This plot shows the aggregated ATT of ZRR financial incentive in the group year method. It can be seen that municipalities that have started receiving the ZRR treatment in 2018 have been impacted negatively, but the number of municipalities in this group year is very low (12 municipalities), which undermines the reliability of the finding.



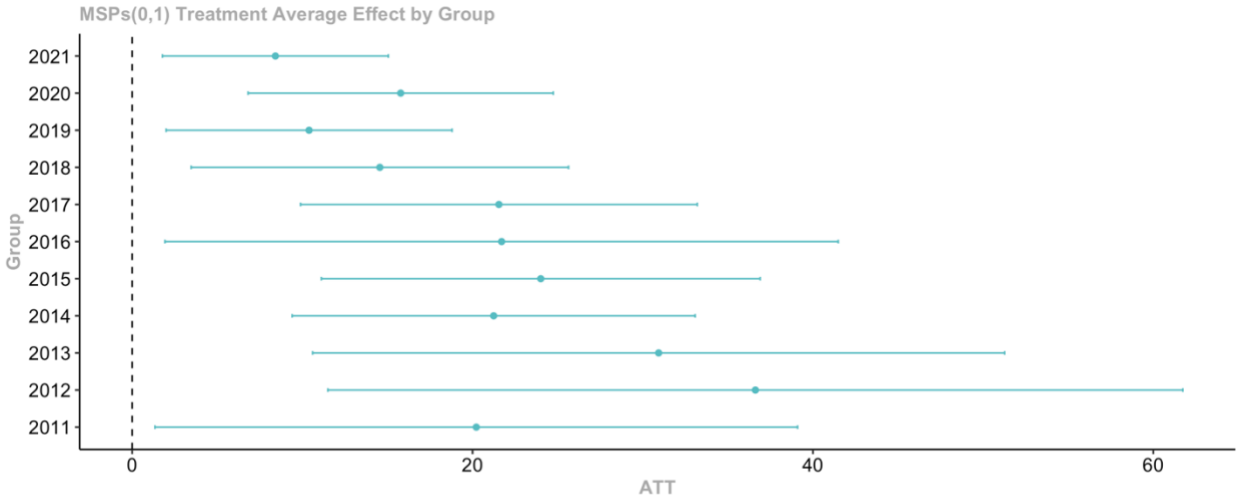
1.Population density and level of equipment included as covariates
2.Municipalities with number of MSPs equal or more than 1 counted as treated and zero as untreated
3.Data source: CNOM

Figure 11: This plot shows the aggregated ATT of MSPs regardless of cumulative financial incentives in the dynamic method. Cumulative financial incentives were not included as covariates either.



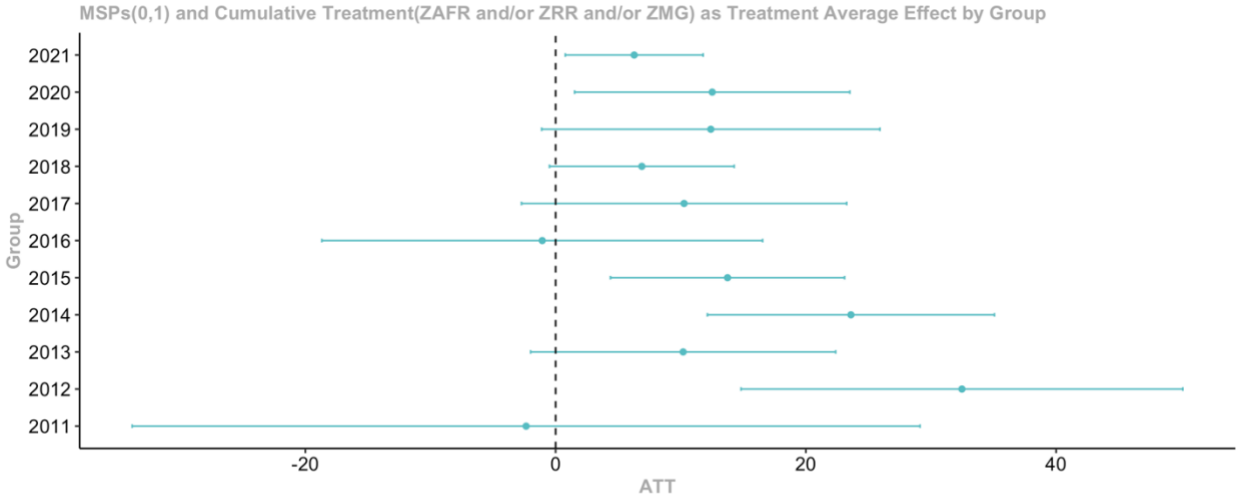
1.Population density and level of equipment included as covariates
2.Municipalities with number of MSPs equal or more than 1 counted as treated and zero as untreated
3.Data source: CNOM

Figure 12: Aggregated ATT of MSPs regardless of financial incentives in the group year (group specific) method: Cumulative financial incentives were not included as covariates in this analysis but still it is in line with the results where cumulative financial incentives are included as covariates.



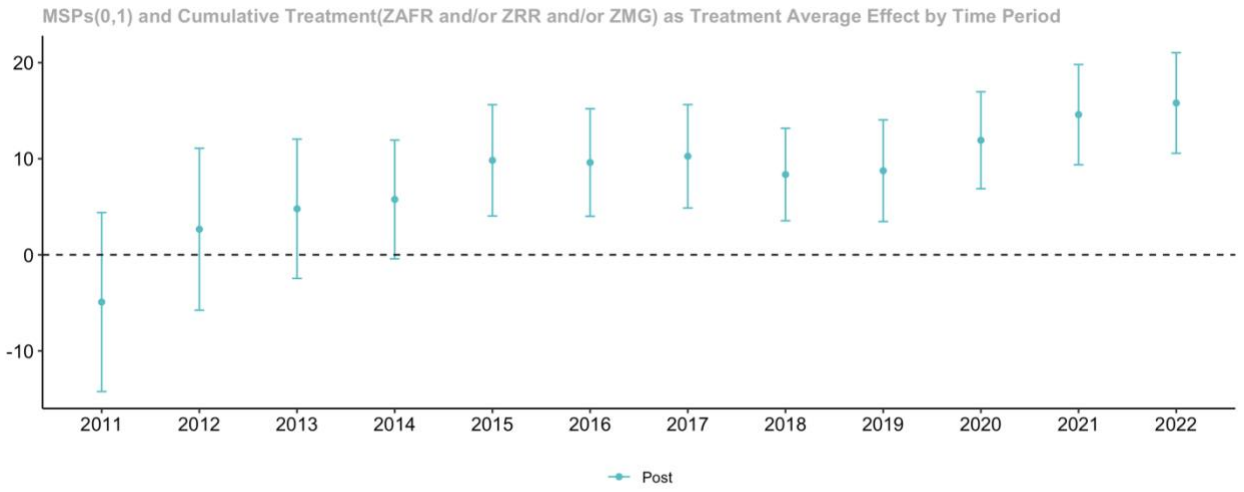
1.Population density, level of equipment and cumulative treatment (ZAFR and/or ZRR and/or ZMG) included as covariates
2.Municipalities with number of MSPs equal or more than 1 counted as treated and zero as untreated
3.Data source: CNOM

Figure 13: This plot shows the aggregated ATT of MSPs regardless of financial incentives in the group year method when cumulative financial incentives were included as covariates. To see the difference, comparison with Figure 12 is recommended.



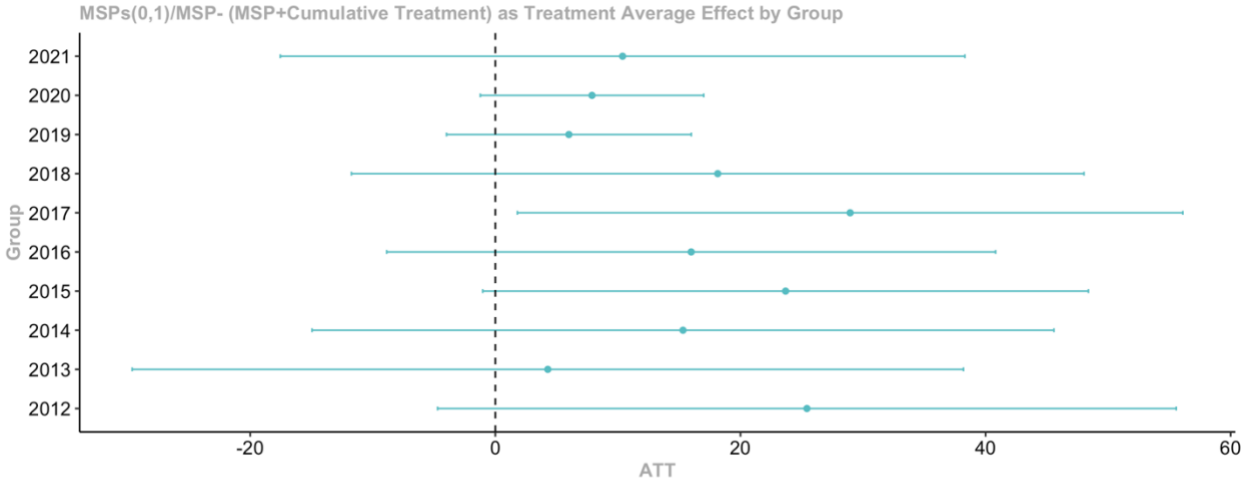
1.Population density and level of equipment included as covariates
2.Municipalities with number of MSPs equal or more than 1 and treated by either of ZAFR,ZRR,or ZMG counted as treated otherwise as untreated
3.Data source: CNOM

Figure 14: The aggregated ATT of MSPs with financial incentives as treatment in group year (group specific) method



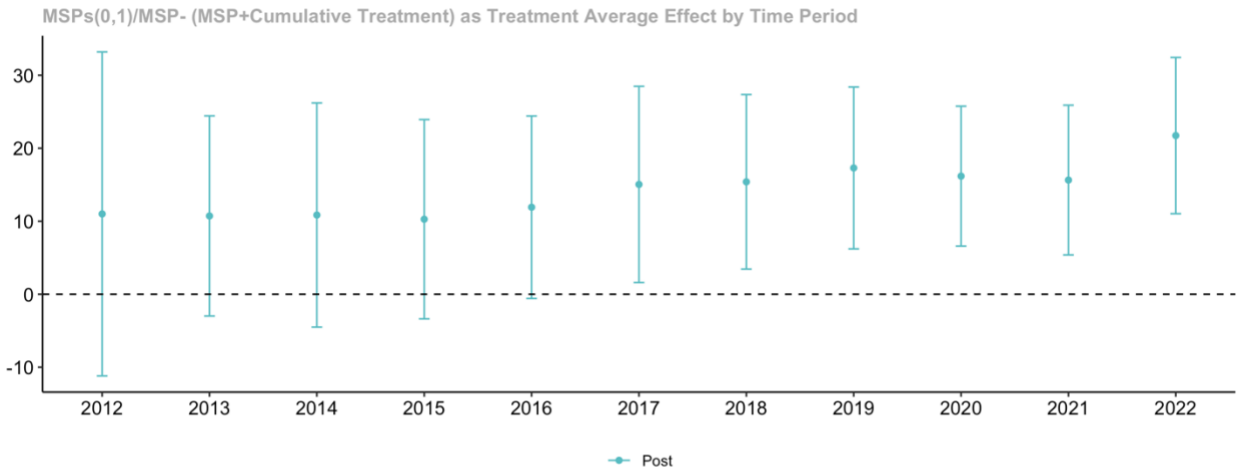
1.Population density and level of equipment included as covariates
2.Municipalities with number of MSPs equal or more than 1 and treated by either of ZAFR,ZRR,or ZMG counted as treated otherwise as untreated
3.Data source: CNOM

Figure 15: The aggregated ATT of MSPs with financial incentives in calendar time method



1.Population density and level of equipment included as covariates
2.Municipalities with number of MSPs equal or more than 1 counted as treated otherwise as untreated
3.The sample size does not include municipalities treated for MSP and Cumulative Treatment simultaneously
4.Data source: CNOM

Figure 16: The aggregated ATT of MSPs without financial incentives in the group year (group specific) method



1.Population density and level of equipment included as covariates
2.Municipalities with number of MSPs equal or more than 1 counted as treated otherwise as untreated
3.The sample size does not include municipalities treated for MSP and Cumulative Treatment simultaneously
4.Data source: CNOM

Figure 17: The aggregated ATT of MSPs without financial incentives in calendar time method

Abstract in French

Introduction/Contexte: Les déséquilibres géographiques des ressources humaines en santé sont une préoccupation majeure en santé publique dans le monde entier. Principalement, l'accès inégal et l'utilisation des services de soins de santé primaires entre les zones urbaines, rurales et périurbaines sont dus à une répartition disproportionnée des professionnels de santé primaires, en particulier des médecins généralistes (MG). La France souffre également d'une répartition inégale des MG entre les zones urbaines et rurales, comme dans de nombreux autres pays. Ainsi, la France a mis en place depuis 2005 des politiques de zonage et d'incitations financières associées dans les communes souhaitées pour réduire la répartition géographique déséquilibrée des MG à travers la France métropolitaine.

Méthodes et Matériels : Pour évaluer les effets des programmes combinant zonage et incitations financières (subventions financières et/ou exonération fiscale), une analyse a été réalisée en utilisant des données agrégées au niveau des communes - provenant de 34 924 communes à travers la France métropolitaine - couvrant la période de 2005 à 2022 et basée sur un design quasi-expérimental en différence de différences pour l'évaluation causale des politiques publiques et des interventions. Les données étaient des données secondaires reçues du Conseil National de l'Ordre des Médecins (CNOM) et de l'Assurance Maladie (Système national des données de santé, SNDS).

Résultats : Cette étude montre que le zonage et les incitations financières associées n'ont pas d'effet positif sur l'installation et la rétention des MG de moins de 40 ans. Les exonérations fiscales ont un impact insignifiant, et les subventions financières montrent un effet négatif significatif dans l'analyse. Cependant, les communes ayant bénéficié de l'expérimentation de l'implantation d'Équipes de Soins Primaires ont eu un impact positif et significatif sur la densité des MG de moins de 40 ans.

Conclusion : Compte tenu des résultats de cette étude et de la littérature existante, les incitations financières semblent ne pas être pertinentes pour réduire le déséquilibre géographique par rapport aux politiques qui se concentrent sur les conditions de travail, comme les Équipes de Soins Primaires. Par conséquent, les politiques visant à promouvoir les pratiques d'équipe pour les MG sont considérées comme efficaces pour réduire le déséquilibre dans la répartition des MG entre les communes.

Mots-clés : Ressources humaines en santé, attraction et rétention des MG, zonage et incitations financières, Équipe de soins primaires