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ABSTRACT

Most nations in the world have side-by-side private and public health care systems. Policymakers worry that "dual practice" across sectors might reduce care to the public sector. This concern led regions in Spain to offer "exclusivity bonuses" to physicians who practice exclusively in the public sector. We show theoretically that the impact of these bonuses on the public sector is ambiguous. We demonstrate empirically that the bonuses backfired: they did increase exclusive participation in the public sector, but significantly reduced hours of work. When regions added offsetting bonuses for dual practice, they were largely ineffective.

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1. Introduction

Most developed nations in the world, with the major exception of the United States, insure their populations predominantly through a publicly financed insurance system. In all of these nations, there is also a significant private sector which delivers care alongside the public sector. Health care providers typically operate in both sectors, both over time (e.g. training initially in the public sector before moving to the private sector) and at a point in time, which is often referred to as "dual practice" (DP).

Dual practice is a common feature of a variety of health care systems, both in developed and less developed countries (Ferrinho et al. (2004), García-Prado and González (2011), Hicks and Adams (2000)). Canada is the only highly developed country where it is strongly discouraged, and even forbidden in some provinces (Flood and Archibald (2001)); recent challenges to the prohibition have been unsuccessful (Minister of Health statement, 2022). In Europe, it is common for providers working in the public sector to also operate in private facilities. For instance, in Ireland almost 90% of doctors employed in public hospitals do so. In the UK about 61% of the NHS consultants also have significant private work (UK Monopolies Mergers Commission (2008)). In 2009, 25% of male physicians and 14% of female physicians in Norway were involved in dual practice (Johannessen and Hagen (2014)). In Portugal, 23% of the publicly employed healthcare workers have a second job (Ferrinho et al. (2004)). In the Spanish context that we explore, around 8% of the healthcare professionals were dual job holders.

Despite the common nature of this practice, it remains controversial. Advocates argue that dual practice allows high-ability providers to continue to work in the relatively low-paid public sector by supplementing their salaries with private sector work (Eggleston and Bir (2006)) while, at the same time, allowing them to build their reputation in highly sophisticated public hospitals (González (2004)). Opponents argue that the additional pay that can be earned in the private sector might distort providers away from providing appropriate care to publicly insured patients (Hicks and Adams (2000), Ferrinho et al. (2004)). Other critics argue that DP providers have incentives to boost waiting lists in the public sector to attract demand for private services (Iversen (1997)) or that DP might use public sector resources for their private practice without the proper compensation. Despite the controversy and the universality of this mode, there is little evidence on the decisions of providers to engage in dual practice, nor on the implications for physician labor supply.

In this paper, we provide such evidence by focusing on a particular policy aimed at encouraging physicians to work exclusively in the public healthcare sector. Our context is

Spain, where 72.9% of health care is publicly financed OECD (2025), but where there is also a thriving private sector. There is particular concern in Spain that allowing dual practice may lead to a conflict of interest for physicians (F. Blanco, Health Minister (2014) [6]; S. Illa, Health Minister (2020) [7]). As a result, a number of regions in Spain have introduced "exclusivity bonuses", which are monetary incentives at the regional level and at different points in time to doctors who commit to working exclusively in the public system. Those workers would receive a monthly salary top-up of their public sector wages if and only if they stop working in the private healthcare sector. Interestingly, and perhaps for reasons that we document below, over time most of these regions then added additional bonuses for those who worked in both the public and private sectors, substantially or completely offsetting the differential incentive to work only in the public sector.

We begin with a model of a two-sector physician market. We extend previous models by allowing for hours adjustments in both the public and private sectors, as well as intensive and extensive labor supply decisions. We show that in such a model, introducing an exclusivity bonus will shift some physicians from joint practice in the private and public sectors to exclusive practice in the public sector, as intended. But it will also have an unintended effect: higher incomes for providers in the public sector will lead to lower labor supply. We also show that a bonus for working in both the public and private sectors may not simply offset this disincentive; the doctors who switched to the corner solution of exclusively public provision remain in the corner solution because of the additional income effect. For those reasons, the net effect of bonus policies on the provision of medical care in the public sector, and overall, is ambiguous.

We then empirically test our model using two different and complementary data sets on the labor supply decisions of Spanish physicians. We first use a large administrative database (*Muestra Continua de Vidas Laborales*) that includes the employment history of 4% of the Spanish population to study the impact of the policy on transitions between public and private employment for health care professionals as well as on their geographical mobility. Next, we employ the Spanish Labour Force Survey to disentangle the effects of the exclusivity policy on an additional employment margin, hours worked. We implement a quasi-experimental design to identify the incentives for health care workers by exploiting the temporal and regional variability in the implementation of the exclusivity bonus across Spanish regions.

[6] link
[7] link

Doing so, we find that these bonuses had mixed effects on the extensive margin. We find that there is a highly significant impact of exclusivity bonuses on participation in the public sector, which is small relative to the stock of workers but large relative to baseline flows into this sector. At the same time, we do not find that there was an offsetting effect of the joint public-private bonuses on participation in either sector. We perform a falsification check using another group of professionals who have a choice across the public or private sectors, professional educators. We also use event study methodologies to confirm the causal interpretation of these findings.

We then move on to model the impact of the bonus on total hours of labor supply among health care providers in Spain. We first use labor force data to show that offering a public exclusivity bonus led to significantly fewer hours of labor provided to the public sector – and a reduction in total hours provided to the health care system.. In particular, we find that increasing the public exclusivity bonus by the average amount in our sample leads to a 1.8 hours/week decrease per worker in public hours, and a 1.2 to 2 decrease in total hours. At the same time, we find that adding the offsetting public-private bonus does not as meaningfully impact hours of work. This finding is in line with our extensive margin result that the public-private bonus does not lead to doctor's switching back into dual practice. We once again confirm these results both with event studies, and with a falsification check for the education sector. We then confirm the results for physician labor supply in our earnings data. This has the advantage of both providing another source of data and adding earlier years, allowing us to carry out event studies. We find negative effects on public sector earnings of the exclusivity bonus, in line with our earlier results. But we now find a rise in private earnings, which suggests that there are general equilibrium impacts of lower private sector hours causing wages to rise. Once again we do not find consistent impacts of the offsetting bonus.

We conclude that this set of policies did not deliver on their promise. We estimate that implementing the exclusivity bonus led to a reduction of 1.8 public-sector hours per week per health professional, representing a 7.1% decline relative to the average. At the same time, we estimate that this bonus program costs the Spanish public health system 967 million euros per year, or 1.5% of total public health spending in 2008.

Our paper proceeds as follows. In the remaining of section 1 we give an overview of the Spanish medical system. In section 2, we provide a model of dual practice that allows us to generate predictions for the impacts of the Spanish Exclusivity Bonus. In section 3, we describe the data sources. In section 4 we provide the main results on extensive and intensive margin effects. Finally, section 5 gives concluding remarks and in the Appendix we provide additional results and robustness checks.

1.1. Overview of the Spanish Medical System

Spain has a fairly typical European healthcare system, with a publicly financed level of basic care and privately financed "top-up" care. 99.1% of the Spanish population is covered by the Spanish National Health System (SNS). The SNS is based on the principles of universality, free access, and equity, and is mainly funded by taxes. Patient cost-sharing for care is restricted to prescriptions as well as some elements of dental care.

The system is decentralized to the 17 Spanish Autonomous Communities (ACs). Their 17 regional health departments have primary jurisdiction over the organization and delivery of health services within their territory. The ACs are responsible for payment with public funds as well as healthcare budgeting. The national Ministry of Health and Social Policy (MSPS) retains authority over certain strategic areas, such as pharmaceuticals, and acts as guarantor of the equitable functioning of health services across the country, including the minimum benefit package, which must be delivered. The transfer of competences in healthcare from the central government to Autonomous communities was a gradual process, which finished in 2002.

As in most other countries, the private sector also plays an important role, and many individuals supplement their public coverage with voluntary private insurance. 29.4% of the population owns a private health insurance plan in addition to the obligatory public insurance (Centro de Investigaciones Sociológicas, Ministerio de Sanidad (2025)). Private health insurance in Spain is supplementary and may provide the same goods and services as those offered by the public sector but with much shorter waiting lists and a much flexible time ability to choose the day and the time of your private sector health visit. Civil servants in Spain can choose whether to be insured (paid with public money) by the public or by a private health insurance. In practice, around 76% of those civil servants have chosen a private insurer (IDIS Foundation (2025)).

In 2024, Spain spent 9.7% of its GDP in healthcare, 2884€ per capita (Spanish Health Ministry). Public expenditure represents 74% of total health expenditure, voluntary private health insurance is 7.3% and the rest is out-of-pocket payments (IDIS Foundation (2025)). Spain had 13,159 primary health care centers, 97% of which are owned by the public sector and 59,587 hospital beds, 69% of which are public (IDIS Foundation (2025)). Every person in Spain covered by the SNS has a primary care doctor of reference. To access a specialist in the public SNS requires a referral from your primary care doctor. This is not the case with private voluntary insurance, where most of the schemes allow patients to access a specialist directly, without a referral from the personal primary care doctor. Notably, Spain has the highest life expectancy in the European Union (OECD (2025)).

The majority of the health professionals in the SNS are civil servants. Their remuneration has two parts: base salary and supplements. The base salary is based on the length of service, but otherwise does not vary by region. The supplement does vary by region and depends on several factors. The first is performance, which basically means achieving certain yearly targets, for instance reducing the prescription of antibiotics or visiting dependent population at their residence. The second is professional accomplishments, which are meant to capture quality elements of each professional, such as involvement in medical research. The third is characteristics of the position, which include bonuses for higher responsibility jobs. Additionally, doctors in Spain are expected to be on-call for extra hours. These hours receive extra remuneration.

The average annual salary of a doctor in Spain after finishing the residency is 49,139€ in 2023, and it gets up to 72,085 after 25 years of experience (Sindicato Médico de Granada (2023)). This is 175% of the median earnings level in Spain in 2023 (which was 28,050€ according to the National Statistics Institute (INE) (2025)). Those salaries vary by seniority and across regions since healthcare competencies are decentralized. For instance, according to Adecco's annual wage guide [8], 46% of doctors under 45 earn less than 40,000 euros per year, while 58% of those over 45 earn more than 55,000 euros. The average salary of a specialist in the Basque Country is 54,148€, while that of a specialist in Murcia is only 40,911€.

Physician labor supply in the public sector depends on the type of position held as well as on the number of on-call hours required (which again depends on the specialty as well as the sector, whether it is hospital or primary care). At the same time, providers can work in the private sector - either exclusively or simultaneously with their public sector work. In contrast to public sector work, private sector work is largely unconstrained and most providers work part-time in one or several private clinics/primary health centers. In our sample period, around 50% of health professionals work exclusively for the public sector, around 42% exclusively for the private sector or are self-employed, and around 8% engage in dual practice. From survey data, we can see that, on average, physicians working exclusively in the private sector can earn between 45,000 and 60,000 euros/year, depending on the

[8] Adecco Healthcare, *Guía Salarial Adecco 2024: Sector Life Sciences & Healthcare*.link

specialty, tenure, and the number of hours billed. The best-paid doctors in this sector are dermatologists who can earn 120,000 euros/year if they have more than 10 years of experience[9] . Therefore, although the mean wage is slightly lower in the private relative to the public sector, the variance in the private sector is much larger. This is partly explained by the fact that public sector wages are fixed as well as by the fact that private sector fees can be freely adjusted according to demand.

Given the concerns over dual practice noted above, some Spanish regions have decided to provide an extra pay bonus. The exclusivity bonus (*complemento de exclusividad*) is a monetary supplement offered to physicians who commit to working exclusively in the public sector, forgoing any private medical practice. This policy instrument is designed to discourage dual practice—the simultaneous provision of care in both public and private settings—which many policymakers view as potentially detrimental to the availability or quality of care in the public system. The exclusivity bonus is typically paid monthly and has varied across regions -ranging from €213 to over €1398 per month. In essence, it acts as a financial reward for doctors who fully dedicate their labor supply to the public sector.

Perhaps because of the responses we document below, several Spanish regions eliminated the exclusivity bonus for public hospital physicians during this period. But rather than simply ending the bonus, the regions did so by absorbing its value into other offsetting bonus components to preserve overall compensation. For instance, Castilla-La Mancha abolished the exclusivity stipend and merged its amount into the general specific pay complement, ensuring total pay remained unchanged, while the Basque Country or La Rioja, substituted the exclusivity compensation for what they called a productivity payment. In each case, the common compensatory mechanism was to integrate the former exclusivity bonus into general remuneration elements, thereby maintaining pay equity while discontinuing the exclusivity incentive.

In total, all regions besides Madrid and Catalonia, had introduced exclusivity bonuses when the Spanish health system was decentralized before the start of our sample. Catalonia introduced the exclusivity bonus in 2007. All other regions, except Andalusia and Galicia, offset the incentive by fully or partially integrating the bonuses into overall compensation. Figure 1 documents the bonus patterns across the regions. For each region, the exclusivity bonus, labeled b_1, is in red and the offsetting bonus, labeled b_2, is in dashed blue. Most regions change their bonus amounts over time, with the most common type of variation being a rise

[9]Spring Professional y LHH Recruitment Solutions, *Guía Salarial Healthcare 2022* (Madrid: The Adecco Group, 2022). link

over several years in the offsetting (b_2) bonus to match the exclusivity bonus (b_1), as is the case of Balearic Islands, Canary Islands, Extremadura, Murcia, Basque Country and La Rioja. However, our policy variation is richer, with some regions such as Asturias, Valencia, and Navarre raising their offsetting bonus to only partially offset the exclusivity bonus and Aragon simultaneously decreasing the b_1 bonus while increasing the b_2 bonus to partially offset the exclusivity benefits.

2. A model of dual practice

In this section, we present a stylized labor supply model of dual practice. Our model extends Renna and Oaxaca (2006) by considering settings in which doctors receive different lump-sum bonuses if they only have a public sector job or if they work simultaneously in the public and private sectors. We show that the exclusivity decision depends on doctor characteristics in line with the theoretical model of dual practice considered in González and Macho-Stadler (2013), however, our model is more general as we allow doctors to change both their public and private labor supply.

We assume a standard static labor supply model with Cobb-Douglas utility and two jobs, where doctors allocate time to their primary job and secondary job according to:

$$
\begin{aligned}
\max_{h_1,h_2,y} \quad & U(h_1,h_2;b_1,b_2) \equiv (\gamma_1 - h_1)^{\alpha_1}(\gamma_2 - h_2)^{\alpha_2}(y)^{1-\alpha_1-\alpha_2} \qquad (1)\\
\text{s.t.} \quad & y = w_1 h_1 + \mathbf{1}\{h_2 > 0\}\pi_2(w_2,h_2,a) + I \\
& \quad + \mathbf{1}\{h_1 > 0\}(\mathbf{1}\{h_2 = 0\}b_1 + \mathbf{1}\{h_2 > 0\}b_2), \\
& 0 \le h_j < \gamma_j \text{ for } j = 1,2, \\
& \alpha_1, \alpha_2 \ge 0 \text{ and } \alpha_1 + \alpha_2 \le 1, \\
& h_1 + h_2 \le T,
\end{aligned}
$$

where h_j is the time allocated to job j (where $j = 1$ denotes the public sector and $j = 2$ the private sector), which is bounded above by γ_j,[10] α_j is the preference parameter for job j (so preferences can be different for each job), w_1 is the wage of the primary job (the public sector job), $\pi_2(w_2,h_2,a)$ are the profits of working h_2 hours in the secondary job (in the private sector) for a doctor with characteristics a and private wages w_2, b_1 is an exclusivity

[10] Public and private contracts in Spain are organized around weekly contracted hours of work plus the possibility of doing additional extra hours (usually with varying wage rates) of work, with a certain maximum of extra hours allowed per week, which leads to an overall cap on the maximum of hours of work. However, we do not expect these caps to be binding or play a crucial role in our theoretical or empirical results.

monetary bonus given if labor is only supplied to the public job, b_2 is the offsetting dual job bonus given if labor is supplied to both the private and public job, I is non-wage income and T is the total time available for leisure and consumption $T = \gamma_1 + \gamma_2$.[11] Departing from Renna and Oaxaca (2006) we model the secondary job as profit maximizing decision that depends on worker characteristics:

$$\pi_2(a, h_2) = h_2 w_2(a) - c,$$

where we take a hedonic equilibrium approach and assume w_2, the private wage, is an increasing positive continuous function with inverse w_2^{-1}, a denotes a summary scalar worker characteristic (such as ability, technicality of the medical specialization or years of education) and c is the opportunity cost of working in the private sector not captured by the labor supply decisions influencing the primary job (for example, increases in commuting costs or costs of running a private practice). An important consequence of our setup is that, as opposed to Renna and Oaxaca (2006), due to the cost c and bonus b_1 and b_2, it might be optimal to not participate in private sector activities. Therefore, our setting allows for dual job holding and corner solutions in which labor is only supplied to the primary public job.

We start by considering the dual practitioners' labor supply response function corresponding to inner solutions of the maximization problem (1) where doctors work in both the public and private sectors:

$$\begin{aligned} h_1^* &= (1-\alpha_1)\gamma_1 - \alpha_1\gamma_2\left(\frac{w_2(a)}{w_1}\right) - \alpha_1\left(\frac{I + b_2 - c}{w_1}\right), \\ h_2^* &= (1-\alpha_2)\gamma_2 - \alpha_2\gamma_1\left(\frac{w_1}{w_2(a)}\right) - \alpha_2\left(\frac{I + b_2 - c}{w_2(a)}\right). \end{aligned}$$

Importantly, the inner solution does not depend on the bonus amount b_1, but depends on the dual bonus b_2, and the response to a public wage increase is increasing in the worker characteristic for the public job and decreasing for the secondary job. Next, consider the corner solution case, which we label the *exclusivity* case, the doctor chooses its public job labor supply according to the constrained problem with $h_2 = 0$. The labor supply function in this case is

$$h_1^E = \gamma_1\left(\frac{1-\alpha_1-\alpha_2}{1-\alpha_2}\right) - \frac{\alpha_1}{1-\alpha_2}\left(\frac{I + b_1}{w_1}\right),$$

[11] We allow for the public and private sector caps γ_1 and γ_2 to be different as the public sector is more inflexible and has stricter contract hour guidelines.

or, alternatively,

$$h_1^E = \gamma_1(1-\alpha_1) - \alpha_1 \left(\frac{I+b_1}{w_1}\right),$$

if the private job is removed all together from the choice set at the time of decision making. Regardless of our choice of h_1^E, a utility maximizing doctor will decide to be exclusive and set $h_2 = 0$ if and only if

$$U(h_1^*, h_2^*; b_1, b_2) \leq U(h_1^E, 0; b_1, b_2),$$

where the utility function depends on the underlying preference parameters and doctor characteristics a. To distill empirical predictions from this stylized model we consider a mass of doctors with different preference parameters and characteristics a, with a joint (differentiable) probability distribution F. Then, the share of public only doctors is given by

$$s(b_1, b_2) = \mathbb{E}_F \left(U(h_1^*, h_2^*; b_1, b_2) \leq U(h_1^E, 0; b_1, b_2)\right) = \int \mathbf{1}\{U(h_1^*, h_2^*; b_1, b_2) \leq U(h_1^E, 0; b_1, b_2\} dF.$$

To understand how the share s changes with the bonuses b_1 and b_2, observe that exclusivity utility condition can be re-written as:

$$\left(\frac{\gamma_1 - h_1^*}{\gamma_1 - h_1^E}\right)^{\alpha_1} \left(\frac{\gamma_2 - h_2^*}{\gamma_2}\right)^{\alpha_2} \leq \left(\frac{w_1 h_1^E + b_1}{w_1 h_1^* + w_2(a) h_2^* + b_2}\right)^{1-\alpha_1-\alpha_2}$$

It follows that increasing b_1 increases the RHS and decreases the LHS of this expression. This can be seen directly as $w_1 h_1^E + b_1 = w_1\gamma_1(1-\alpha_1) - \alpha_1 I + b_1(1-\alpha_1)$, which is increasing in b_1 as $\alpha_1 \in [0,1]$, and h_1^E is decreasing in b_1, so $\gamma_1 - h_1^E$ is increasing in b_1 and $\left(\frac{\gamma_1 - h_1^*}{\gamma_1 - h_1^E}\right)^{\alpha_1}$ is decreasing in b_1 ceteris paribus. Therefore, conditional on b_2, $s(b_1, b_2)$ is increasing in b_1. We demonstrate this formally in the Appendix Section A.2.

The following result summarizes the predictions of the model for the extensive margin decisions of the doctors.

Result 1: (*Extensive margin*) The share of public-only practitioners is increasing in the exclusivity bonus b_1 conditional on b_2 and decreasing in the dual bonus b_2 conditional on b_1.

Observe that, as a corollary to result 1, a similar argument can also be used to show that when b_1 and b_2 are increased we expect some movers from the private-only group into the public-only and the public-private groups, respectively. Intuitively, as the incentives for holding public jobs are increased by the bonuses, some private workers will decide to seek a public job. In practice, however, due to the rigidity and structure of the public sector hiring process[12] private-only workers might be less responsive to the bonuses (we explore this hypothesis empirically in Table A.7 and Figure A.3 in the Appendix and do not find significant results).

Another consequence of our theoretical set up is that equalizing the public-only bonus b_1 need not revert an exclusivity decision. For preference profiles in which the worker prefers the public-only job ($\alpha_1 < \alpha_2$) and large enough b_1 bonuses, increasing b_2 to match b_1 may not lead to an inner solution, given that the income effect of a larger b_2 on h_2^* might make the non-negativity constrain on h_2 bind maintaining the corner solution. That is, intuitively, doctors that preferred the public job, but needed to complement their income by doing some hours in the private sector, might drop the private job when b_1 is raised, but not retake it when b_2 is raised to match b_1 because at that new higher level of income it is no longer necessary for them to find a private complement. In the Appendix Section A.3, we provide simulation evidence of this phenomenon calibrated to our empirical setting.

Next, we consider the intensive margin change on the number of hours doctors devote to their primary public job and private jobs from changes in the bonuses. For doctors who do not change their status, that is remain public only or dual workers, changing the bonuses has a pure income effect. Increasing the b_1 bonus decreases the labor supply of public-only workers (h_1^E) and increasing b_2 decreases both the public and private hours of dual workers (h_1^*, h_2^*).

For doctors who decide to change their status, the impact on private hours are fairly clear: movers that become exclusive when b_1 is increased will see their private hours decreased to zero, while movers that become dual workers when b_2 is increased will see their private labor supply increased (from zero). What happens to their public labor supply is more ambiguous. For simplicity, consider the change between the dual optimal public labor supply and the exclusive case in which the private job is not considered:

$$h_1^E(b_1) - h_1^*(b_2) = \underbrace{\alpha_1\gamma_2\left(\frac{w_2(a)}{w_1}\right)}_{SE} - \underbrace{\alpha_1\left(\frac{c + b_2 - b_1}{w_1}\right)}_{IE}.$$

[12]In Spain, the allocation of residency (MIR) positions in medical specialties is determined by a national, merit-based system. A candidate's ranking in the MIR exam, along with their academic record, dictates their ability to choose their preferred specialty and hospital training program. The process is essentially a sequential allocation mechanism where higher-ranked candidates get first choice. For instance, in 2025, there were 9,007 slots for 13,691 applicants link.

Whether the expression above is non-negative (that is, the substitution effect SE is at least as large as the income effect IE) will depend on the relative size of the bonuses b_1 and b_2. If the b_1 bonus increase is larger than the total income available in the private job (i.e. $b_1 > b_2 + \gamma_2 w_2$) then the IE will dominate and the mover will lower its public labor supply. In our setting, we do not observe the difference in bonuses to be larger than the maximum wage income in either job, so it is reasonable that the SE dominates and public hours increase for switchers that become exclusive due to bonus increases. Similarly, if $b_2 \geq b_1 - \gamma_2 w_2$, which is likely given that we expect $b_1 - b_2 < \gamma_2 w_2$ (with $b_1 = b_2$ trivially satisfying this), the SE will dominate for switchers that become dual after a b_2 bonus increase and their public labor supply will decrease relative to exclusivity. An equivalent argument can be used to study hour changes for movers from private-only to the public-private group. The following result summarizes the different effects.

Result 2: (*Intensive margin*) Increasing the exclusivity bonus b_1 leads to:

1. A decrease in the public labor supply of public only doctors (IE).
2. Among the doctors that decide to drop the private job due to the change in the exclusivity bonus, an increase in their public labor supply (SE dominates IE).
3. No change for dual job holders.

Increasing the dual bonus b_2 leads to:

1. A decrease in the public and private labor supply of public only doctors (IE).
2. Among the public-only doctors that decide to get a private job due to the change in the dual bonus, a decrease in their public labor supply (SE dominates IE).
3. Among the private-only doctors that decide to get a public job due to the change in the dual bonus, an increase in their public labor supply and a decrease in their private labor supply (IE).
4. No change for public only job holders.

Result 2 highlights that the intensive margin response on the public labor supply due to increasing the exclusivity bonus b_1 is *ambiguous*. On one hand, doctors that were already public only decrease their labor supply, but on the other hand the doctors that decide to drop their secondary job increase the labor supply of their primary job. Which effect dominates is an empirical question that we investigate in Section 4.

Such a discussion ignores the role of demand, however. Total health care demand is only modestly elastic with respect to factors such as price and distance. Therefore, market responses are likely to attenuate the decrease in total labor supply to help meet the demand for care. For example, in the extreme case in which health care demand is perfectly inelastic and wages can adjust without frictions, we might expect wages to increase to completely compensate the decrease in labor supply. In the Appendix Section A.4, we provide more detail on how to extend the theoretical predictions to include general equilibrium effects on total labor supply. In particular, we highlight that these effects can lead the public-only bonus to raise wages in the private sector. If public wages cannot be flexibly changed and the only channel of adjustment to meet a fixed healthcare demand is private wages, then the private sector might raise private wages over time to attract healthcare professionals and meet the excess demand.

3. Data

3.1. Employment History Data (MCVL)

Our primary data source is the Continuous Sample of Working Lives (”Muestra Continua de Vidas Laborales”, MCVL), a rich administrative microdataset from the Spanish Social Security Administration. Each annual wave contains a 4% random sample of individuals who, during the reference year, contributed to the social security system (either through employment or unemployment schemes) or received contributory benefits (e.g., permanent disability, retirement). The size of the sample amounts to over 1 million people per year.

Our analysis starts in 2003, just one year after the health competences had been fully transferred to the regions, and all of them had autonomy to decide on health policies such as the exclusivity bonus. [13]

Although the MCVL began in 2004, we use data from 2005 onward due to data quality issues in the initial wave. Since the MCVL records the entire labor history of each sampled individual retrospectively and up to 2017, we can fully recover employment status and employer type for 2003 and 2004 without any need for imputation or exclusion.

The information contained in the MCVL is organized into four main components: personal records, contract records, tax records, and contribution base records. The personal

[13] As previously mentioned, the transfer process was gradual and some regions had autonomy already before 2002.

records include demographic and geographic variables such as gender, age, place of residence, and nationality. The contract records contain variables related to individual identification (e.g., personal ID, social security number), employment characteristics (e.g., contributory scheme, contract type, full- or part-time status, start and end dates, reason for termination), and employer attributes (e.g., industry classification, firm size, employer tenure).

The tax records provide each individual's annual earnings at the contract level. These allow us to capture both public and private income, independently of whether the individual holds an employment contract or works as a professional. Finally, the contribution base records report the monthly taxable base used for social security contributions. These data are particularly useful for identifying earnings in the early years (2003–2005), as tax data are only available from 2006 onward and exclude the Basque Country, Navarra, and self-employed workers. While contribution bases are capped at the legal maximum (e.g., €3,751.20/month in 2017), they enable us to approximate total income for all regions, workers, and years. We use both sources in our analysis to ensure complete earnings coverage over the full study period.

From the consolidated dataset, we identify individuals working in the health care sector. This number varies from 20,206 such individuals in 2003 to 28,569 in 2017. We define health care workers based on economic activity sector and contribution group codes [14]. For each year, we classify individuals as working in the public sector, private sector (including self-employment), or both, depending on the kind of contract by year.[15] This allows us to track dual practice over time as well as compute total earnings.

Table 1 presents a descriptive overview of the health care sample, bonuses and key aggregate trends from 2003 to 2017. On average, 50% of workers are employed exclusively in the public sector, 42% exclusively in the private sector or self-employed, and 8% engage in dual practice. This implies that around 13.8% of public-sector health professionals also held a private or self-employment position in a given year.

[14] Codes correspond to 851 for CNAE-93 from 2003 to 2008; 861, 862, and 869 for CNAE-09 from 2009 to 2017. Contribution group: 0 No reported (mainly self-employed); 1 Engineers, university graduates, and senior management; 2 Technical engineers, certified specialists, and assistants.

[15] When individuals signed more than one contract with the same employer and performed the same job within a year, we consolidated these contracts using a three-step procedure: (1) we selected the contract with the highest income at the individual-employer-year level; (2) if multiple contracts had identical income or lacked income data, we retained the longest one; (3) if these criteria did not resolve the case, we retained the first-listed contract. This last filter was only implemented in less than 1% of total contracts.

3.2. Spanish Labor Force Survey (EPA)

To measure labor supply—specifically hours worked, we turn to the Spanish Labor Force Survey (Encuesta de Población Activa, EPA), a quarterly rotating panel that interviews roughly 64,000 households ($\approx$ 150,000 adults). Each respondent is followed for six consecutive quarters; to avoid repeat person-years we retain only the last quarter interview. Applying the same occupational filters as in the MCVL yields about 3,500 health professionals per year between 2006 and 2016 [16], 30% of whom are male with a mean age of 45.

The key advantage of the EPA is that it records usual weekly regular hours in the main job, information missing from administrative sources (MCVL). Although the survey lacks earnings, these hours variables allow us to examine how public- and private-sector work time adjusts to the exclusivity bonus.

Table 2 reports descriptive statistics: health professionals work on average 25.5 hours per week in the public sector and 10 hours in the private sector, summing to 35.5 hours. Public-only workers average 37 hours, whereas private-only workers average 35 hours.

3.3. Exclusivity and Off-Setting Bonuses

The exclusivity bonus and its offsetting bonus are based on data from physicians' union reports. For 2003–2008, we use figures reported by the *Sindicato de Granada*. For 2009–2012, we rely on reports from the *Sindicato de Navarra*. From 2013 onward, we have used data from various medical unions when available. In cases where data are missing, we impute the bonus using the last reported value for the corresponding region. The amount of every bonus is detailed in Table A.1 in the Appendix.

4. Impact on Physician Labor Supply

4.1. Dual practice decision: extensive margin

The stylized theoretical model of Section 2 makes two clear predictions regarding the dual practice decisions of providers when the offsetting bonus (b_1) and dual bonus (b_2) are increased: (1) the share of public-only providers should increase with b_1 conditional on the dual bonus b_2 and vice-versa (2) the share of public-only providers should decrease with b_2 conditional on the offsetting bonus b_1. In this section, we study the predictions empirically by using the exogenous variation across regions and time in the amount of each bonus. We

[16]The EPA suffered a methodology break between 2004 and 2005 (new questionnaire, CATI collection and 2001 census weights), making data before 2005 non-comparable (INE, *Nota Informativa EPA 1T-2005*). link

do so by using the MCVL panel of health professionals.

4.1.1. Empirical Strategy

To estimate the effect of interest we restrict our sample to public-only and public-private workers and let $Y_{jit} \in \{0,1\}$ denote the indicator of membership to the public-only group for worker j in CCAA i in year t. Our data is then given by the sample $\{(Y_{jit}, b_{1,it}, b_{2,it})\}_{jit}$, where $b_{1,it}$ and $b_{2,it}$ denote measures related to the offsetting bonus and dual bonus respectively at time t in the region worker j belongs to. In our analysis, we consider binary bonus indicators, the euro amount and, in the Appendix, we also consider the euro amount relative to the average salary in the baseline year as an alternative policy variable. Our main regression specification is:

$$Y_{jit} = \alpha_i + \lambda_t + \rho_1 b_{1,it} + \rho_2 b_{2,it} + \boldsymbol{X}'_{jit}\boldsymbol{\beta} + \epsilon_{jit},$$

where α_i denote CCAA level fixed effects, λ_t time fixed effects and ϵ_{jit} is assumed to be a mean-independent error term with state dependent variance. The $\boldsymbol{X}$ includes region-year dependent controls (the GDP per capita, the unemployment rate, the share of population above 65 years of age, the public deficit and the number of hospital beds) and individual characteristics (age and sex). The parameter of interests ρ_1 and ρ_2 are identified as the average marginal effect of increasing a bonus relative to keeping the other bonus constant under the conditional independence assumption $Y_{jit} \perp b_{1,it}, b_{2,it} \mid \boldsymbol{X}_{jit}, \alpha_i, \lambda_t$. We posit that the conditional independence assumption may be reasonable in our setting given that the exclusivity bonus changes in Spain are due to political processes (e.g. government changes or union pressures) and mostly independent of health care system trends which we control for by adding the fixed effects as well as the time varying spending and health care size controls (public spending and the number of hospital beds).

To test the validity of this assumption, and ensure that any estimated causal effects are not due to unobservable trends, we perform a falsification test and additionally consider an event study design. The falsification tests consist of replicating our analysis for a group that should not be affected by the policy. The group consists of education professionals, a set of workers similar in characteristics to doctors, but who do not receive a bonus during our sample period. We define this group as high school and university professors. These education professionals share key professional characteristics with physicians – both are highly educated, enjoy considerable job autonomy, and often have opportunities for dual employment in public and private sectors. Forty-eight percent of educational professionals in our sample work only in the public sector and 40% only in the private sector, with 11%

being dual. This compares well with our sample of health professionals.

Moreover, in Spain, both education and health services have been decentralized to the Autonomous regions, and the two sectors represent the two major groups of public employees. In Catalonia, for instance, 44.8% of the total regional government budget is devoted to healthcare and education. Healthcare and education professionals represent 25% and 34% respectively of all the public employees of the Catalan Government (source: Generalitat de Catalunya). The policy does not impact the educational system, so we would not expect to see a significant relationship with the exclusivity bonus.

In addition to our main regression specification, we also consider an event-study design to evaluate the treatment effect of CCAAs that changed their dual practice incentives by changing the b_1 and b_2 bonuses over time. In this context, a failure of the identifying assumptions could be highlighted by observing significant pre-trends before the changes in the policy bonuses.

Following the notation in Sun and Abraham (2021), Chen et al. (2025) and Athey and Imbens (2022), let the treatment be denoted by D_{it} and the cohort indicators by $G_i = \min\{t \mid D_{it} = 1\}$, corresponding to the first year in which a CCAA receives the treatment with $G_i = \infty$ denoting the CCAA that are never treated. We define absorbing treatments, which allows us to index the potential outcomes by the cohort indicator $Y_{jit}(G_i = g)$, such that the observed outcome is given by $Y_{jit} = \sum_{g\in\mathcal{G}} \mathbf{1}(G_i = g)Y_{jit}(g)$, where $\mathcal{G}$ denotes the support of G_i.

We consider two separate treatments; the public only treatment, $D^e_{it} = \mathbf{1}(b_1 > 0)$, is equal to 1 if the exclusivity bonus b_1 positive, and the dual treatment ($D^d_{it} = \mathbf{1}(b_2 > 0)$, is equal to 1 if the dual bonus b_2 is positive. In our sample, only Catalunya increases the public only bonus b_1 from zero and only Madrid never has either bonus ($b_1 = b_2 = 0$). On the other hand, several CCAA raise their dual bonus b_2 from zero, allowing us to separately investigate the effect of changing each bonus instrument. The choice to focus on each bonus separately is motivated by the theory section in which each bonus affects the public and private labor supply of different groups of doctors.

Our target causal parameter is based on the average treatment effect at time t of having started treatment at time g relative to cohort g' for the units in the g cohort:

$$ATT(g, g', t) = \mathbb{E}[Y_{jit}(g) - Y_{jit}(g') \mid G_i = g, \mathbf{X}].$$

As discussed by Athey and Imbens (2022) and Sun and Abraham (2021) a natural choice of comparison group is the never treated cohort $g' = \infty$, but other choices are possible, such as cohorts that are always treated ($g' = 1$) or cohorts that have no changes in treatment ($g' = 1$ or $g = \infty$). Given that we only have one never-treated group (Madrid), in our analysis, we will consider the group of never changers as the main control group (and provide the estimates relative to the other groups in the Appendix Figure A.1). To summarize the ATT over the different cohorts, we consider the following event-study causal parameter as defined in Chen et al. (2025):

$$ES(e, g') = \mathbb{E}[ATT(G_i, g', G_i + e) \mid G_i + e \in [2, T], \mathbf{X}],$$

which corresponds the weighted ATT over different cohorts e periods after treatment. These parameters can be aggregated over the post-treatment period to summarize the average effect of the treatment:

$$\bar{ES}(g') = \frac{1}{|\mathcal{E}|} \sum_{e \in \mathcal{E}} ES(e, g'),$$

where $\mathcal{E}$ is the set of post-treatment event times. This estimand can be estimated consistently using the Sun and Abraham (2021) imputation estimator under a conditional parallel-trends assumption that mirrors our conditional independence assumption and ensures that if the treated units had received the treatment at the time of the control units their trajectories would have been equal in expectation.

As an additional check we also estimate the treatment effect for the b_1 bonus using the Synthetic Differences-in-Differences (SDID) estimator of Arkhangelsky et al. (2021) to flexibly account for potential differences between our treatment and control groups. The SDID estimator finds the combination of control units and time periods that best replicate the per-treatment account to partial time-varying unobserved heterogeneity that may impact the results in the post-treatment period.

4.1.2. Extensive margin

Our extensive margin results for the main regression specification are shown in columns (1)-(2) of Table 3 ; we only show the coefficient of interest, and we provide the full specification in the Appendix (Table A.2). The table shows that there is a significant impact of the exclusivity bonus on the number of providers and healthcare workers choosing to work only in the public sector. Implementing the average exclusivity bonus a worker receives in our sample of 652 euros[17] would lead to a 2.5% increase in the public-only share (using the coefficient from column 2), controlling for the dual bonus amount. Similar effects are found if we consider the binary bonus indicators (column 1), with raising the exclusivity bonus

[17] This is the average b_1 bonus a worker receives in our MCVL sample across years and regions.

from zero leading to a 1.85% increase in the public-only share. Table A.2 in the Appendix shows that the effect is similar when we use the size of the bonus relative to the average public wage in 2003.

This is a relatively large increase considering the size of the public-private group. For example, on average, we have that 14% of public workers are in public-private, meaning that the policy reduces the share of dual workers by about 18% relative to the average share.

Putting this effect in context of existing rates of sectoral mobility highlights the sizable impact of this policy. As shown in the descriptive Table 1, we can see that on average in our sample there are around 12.807 public-only workers per year and that about 482 workers move from dual practice to public only on average every year. It follows that a 2.5% change in the public only share is equivalent to increasing the public-only group by 320 workers. This means that the exclusivity bonus incentive may amount for a substantial share (66%) of the dual practice to public-only movers on an average year.

On the other hand, as can be seen in the offsetting rows of Table 3, we do not find a statistically significant effect of increasing the dual bonus b_2. Not only are the effects not statistically significant, but they are also smaller in magnitude relative to the estimated effects for the b_1 bonus. This finding suggests that while increasing the benefits of being exclusive (increasing b_1 while b_2 is fixed) may have some bite in convincing dual workers to drop their private job, the opposite may not be true. Once doctors are public only it may take more than just increasing the incentives to be dual workers for them to decide to open a private practice or take a secondary job. This difference has some grounding in anecdotal evidence suggesting that doctors may not return to private practice once they have already become exclusive. Furthermore, as discussed in the theoretical section due to the additional income effect of raising the offsetting bonus b_2 to meet the exclusivity bonus b_1, doctors may not escape the corner solution once they have become public-only despite the increase in b_2.

Columns (3)-(4) in Table 3 show the main regression estimates for our control group, educational professionals, who have a comparable public-private split but are not offered these bonuses. As a result, these results can show us whether our findings just reflect shift in tastes for professionals across sectors. We find statistically insignificant effects for both the offsetting bonus and the public-only bonus and coefficients of smaller magnitude or the opposite sign than for the health professionals sample. This suggests that if there were unobserved factors affecting the public-private decision of workers correlated with the timing of our bonus changes, they may not be the main drivers of our results.

To further explore our main findings, in Figure 2 we show the estimates for the event study designs. In panel (a) we provide the event study for the b_1 bonus comparing Catalunya, that raises its bonus from zero, with the CCAA that never change their b_1 bonuses, while controlling for the b_2 bonus. We find that the bonus has a positive effect on the share of public-only workers over time, with the aggregated ATT ($\bar{ES}$) being 0.02 over the post-treatment period. In panel (c), we use a weighted average of the control units and time periods with the weights chosen to optimize the pre-treatment parallel trend, as proposed by Arkhangelsky et al. (2021), and find a similar result with the aggregated ATT being 0.026. The graph shows the trajectory of the public-only share for the treated unit in blue and for the synthetic control in red before and after the treated unit increases the exclusivity bonus in 2007 as in a standard Difference-in-Difference design. The interpretation of the parameter estimate is the same, but the estimator controls more flexibly for hidden confounders related to time-varying differences between treated and control regions. In all cases, the control group and Catalunya appear similar in the pre-treatment period, suggesting that the post-treatment effect is coming from the increase in the offsetting bonus and not unobserved heterogeneity. As with the main results in Table 3, we find no statistically significant effect for the b_2 bonus as can be seen in the event study in panel (b), for which the aggregated ATT is not statistically different from zero.

4.2. Labor response: intensive margin

As highlighted in the discussion of our dual practice model, the impact of the public bonus on total hours of care is ambiguous. Within the public sector, there are two offsetting impacts. On the one hand, the intended impact of the offsetting bonus is to bring more hours of labor supply into the public sector by reducing time spent on dual practice. On the other hand, those who are already in the public sector will reduce their hours due to an income effect. The prediction for the private sector is also unclear: while a shift out of dual practice lowers private hours, at the same time, there could be an increase in private hours to meet the unmet demand due to a decline in public labor supply, as discussed in the theory section.

We use EPA data of repeated cross-sections of health professionals, to explore the intensive margin response due to exclusivity bonus changes. We do so by estimating a similar model to our main regression, but for hours worked variables:

$$H_{jit} = \alpha_i + \lambda_t + \rho_1 b_{1,it} + \rho_2 b_{2,it} + \boldsymbol{X}'_{jit}\boldsymbol{\beta} + \epsilon_{jit},$$

where H_{jit} denotes weekly contractual hours (public, private or total) for worker j in the

CCAA i and year t, α_i and λ_t are CCAA and year fixed effects, and $\boldsymbol{X}_{jit}$ includes the same controls as in the main regression specification.

Table 4 shows the results of the labor supply regressions disaggregated into effects on public sector weekly hours, private sector weekly hours, and total weekly hours. We find that increasing the public-only bonus—while holding the public-private bonus differential constant—leads to a reduction in public hours worked. Specifically, introducing a non-zero binary public-only bonus results in an average decline of 1.8 public hours per week (column 1), which corresponds to approximately 7% of average public hours. This change is also associated with a 1.2-hour decrease in total weekly hours. When using our second specification—the euro value of the bonus- we find that the estimated effect on public hours is not statistically significant but similar in magnitude. For instance, increasing the public-only bonus by its average value in our sample (652 euros) leads to a 1.78 hour reduction in public weekly hours versus 1.8 hour decrease for the binary bonus. The effect on total hours, with the same increase in the bonus, corresponds to a 2-hour weekly reduction in total hours worked.

As the data contains a set of repeated cross-sections, this decline in hours could reflect two different effects: a decline in hours among those who were already in the public sector (through the income effect) and the selection of new workers into the public sector who work relatively low hours. However, it seems likely that the selection effect on public hours is smaller given that the number of entrants/movers is small relative to the stock of workers. From Table 3 we expect that the bonus leads to at most a 2.5 % increase in the public-only share relative to the average, and new workers account for a small share of the overall stock of workers. This suggests that movers and entrants can only account for a minority of the total hour change, and that the effect is primarily driven by the income effect on existing public sector providers.[18]

Turning to the public-private bonus, we find effects that are smaller in magnitude and mostly statistically insignificant, in line with our previous results in Table 3. For the euro amount measure, we do observe a positive increase in total hours, driven by an increase in

[18] In our sample, we expect at most 320 workers per year to move to public-only because of the bonus as previously discussed in the text. Net entrants (new entrants - leavers) for the average year are about 545 workers per year, for a total of 875 potential extensive margin new workers. Given that we observe 25,744 workers for the average year, the new workers could imply at most an estimated coefficient of [(Number of Workers - New Workers) $\times$ Avg Pub Hours + New Workers $\times$ New Hours]/Number of Workers $-$ Avg Pub Hours = $((25744-875)\times 25.16+875\times 0)/25744-25.16 \approx -0.86$ or 48% of our observed effect (-1.8), if they entered at zero public hours (which is highly unlikely). Alternatively, if they entered at the average private hours (10.38), also a lower bound, they would imply $((25744-875)\times 25.16+875\times 10.38)/25744-25.16 \approx -0.51$ or 28% of our estimated effect.

public hours. This increase is smaller in magnitude than the one we find for the public only bonus (between 2 times and 3 times smaller); but potentially at odds with the predictions of the theoretical model. A justification for this behavior, which we explore in more detail in the Appendix Section A.5, is the existence of part-time public contracts, and the requirement in some CCAA that a minimum threshold of public hours be done to receive either bonus. In such settings, we might expect some dual doctors that were previously only part-time public workers to increase their public labor supply to meet the threshold and receive the bonus, explaining the observed increase. Unfortunately, due to the EPA data being repeated cross-sections we cannot separately investigate this bunching phenomenon as we do not observe the same workers over time.

Overall, however, Table 4 shows that the impact of the b_2 bonus on labor supply is less important than the one of the b_1 bonus, as we expected given that the b_1 bonus targets a larger share of the workforce (the public-only group). Whereas a 652 euros increase in the b_1 bonus leads to a 2 hours decrease in total weekly hours, the same increase for the b_2 bonus leads to a 0.78 hours increase (three times less).

In line with our main regressions, we also perform the falsification test for the labor supply regressions using the higher education professionals group. In Table 5 we estimate the same models as in Table 4, but for the education group. When using the dollar amount data, we find no statistically significant results across specifications, with coefficients being an order of magnitude smaller than in Table 4 or in the opposite direction. This is indicative that our identifying assumptions may capture well the setting and that the bonus changes are not correlated with other factors affecting the intensive labor supply decisions of workers in the 2006-2016 period. For the binary bonus amounts we find no statistically significant effects for the exclusivity bonus and coefficients that are smaller and of different sign than for Table 4. For the public-private bonus we find a statistically significant effect, but this is in the opposite direction of our findings for the health professionals.

Note that this sample period is different than the one we used for the main extensive margin regressions, as we have more years of data for the MCVL sample than for the EPA sample as detailed in the data section. In the Appendix Table A.3, we repeat the extensive margin regressions for the 2006-2017 period to match the hour regressions as a robustness check and find similar results.

4.3. Labor response: Earning Data

To complement our analysis of the intensive margin change in labor supply we also consider the effect of the bonuses on earnings (wages times hours) net of bonuses. We can measure earnings in the MCVL sample in two ways, using a salary proxy based on social security contributions (which is top and bottom coded) or by linking our data to tax records, which can only be done partially and from 2006 as detailed in the data section (we show results based on this measure in the Appendix Section A.1).

Incorporating these earnings data has two advantages. First, they provide an independent source of confirmation of our estimated effects. Second, for the contribution-based salary proxy we have data from 2003 and are able to carry out an event study design with pre-treatment estimates, which we cannot do for hours (or for the tax-based salary measure that start in 2006). But there is one disadvantage: we are now measuring the product of wages (excluding bonuses) times hours. Given rigid wage setting in the public sector, this should not impact our results. But as the general equilibrium extension of our model in the Appendix Section A.4 shows, changes in bonuses can impact private sector wages. In particular, the exclusivity bonus, by pulling workers out of the private sector, can raise wages.

Table 6 shows the regression estimates for the proxy salary measure net of bonuses, using the same specification as the main regressions with worker fixed effects to account for within region individual salary differences. In the Appendix, in Table A.6 we provide the regressions with region fixed effects and find similar results. In line with our findings for hours worked and the theoretical model, Table 6 column (1) shows that implementing the public-only bonus leads to a public earnings decrease of 177.2 euros per month. Similarly, in column (4), we find that raising a public-only bonus to the average amount (652 euros) would lead to a 237 euros decrease in public earnings. Given our estimates in Table 4 of the public hour adjustment due to the bonus of -1.8 public hours per week, we place the implied wage rate at 22.8 and 30.3 euros per hour, respectively, if all of the earnings change came from hour adjustments. These hourly rates are commensurate with the upper end of remuneration for the additional ("extra") hourly pay in public hospitals in Spain, indicating that a significant part of the public earnings adjustment may come from hour changes.[19]

Column (2) of Table 6 show that there is a positive effect of the public-only bonus on private earnings that partially off-sets the decrease in public earnings net of the bonuses. We

[19]According to Ilerna the average additional hour remuneration for doctors is around 29 euros in business days and 31 euros in weekends, with significantly higher numbers for holidays and nights (link).

estimate an increase of 152.1 euros per month for the binary bonus measure (or 72 euros for the average public-only bonus in column 5). Given that we do not find a significant increase in private hours due to the bonus in Table 4, we conclude that private wages must also have risen due to the policy. As we discuss in the Theory section and in the Appendix, private earnings may increase because of a general equilibrium reaction to the decrease in public labor supply (and pub-priv workers) to maintain private labor supply. While this increase in private earnings offsets part of the drop in public earnings, overall we find that total earnings decrease as can be seen in column (4). This is in line with our hours results in Table 4 in which we also find a decrease in total hours. In the Appendix, in Table A.4 we replicate the results for the tax-based salary measure and find similar results.

For the contribution-based salary proxy we can estimate the event-study design with pre-treatment periods. In Figure 3 we show the estimates for the b_1 bonus in panel (a) and the b_2 bonus in panel (b). Panel (a) shows that when the public-only bonus is implemented public earnings decrease over time and private earnings increase over time. These results mirror the findings in Tables 4 and 6 and the general equilibrium story that the decrease in public hours is partially compensated by the private sector with an increase in wages over time. We also see that the pre-treatment coefficients are smaller in magnitude than the post-treatment coefficients, indicating that we might adequately control for unobserved trends correlated with the timing of the policy changes. In the Appendix, Figure A.2 we replicate the event-studies with region fixed effects and find similar results, with tighter pre-trends.

In panel (b) of Figure 3, on the other hand, we show that the effects for the dual bonus are smaller and generally statistically insignificant, with the b_2 bonus moderately decreasing total earnings due to a decrease in private earnings. This can also be seen in Table 6, in which we find a statistically significant result for the offsetting bonus decreasing private earnings and total earnings. This finding can be reconciled with 4, in which we find a moderate increase in total hours due to the offsetting bonus, given that private hours may be paid more highly than public hours. However, as can be seen in the falsification test with the education group for the earnings regression (Appendix Table A.5), while for the public-only bonus we find statistically insignificant coefficients an order of magnitude smaller than for Table 6, for the offsetting bonus we find results closer in magnitude to the ones for health professionals, potentially indicating the dual bonus finding is spurious.[20]

[20]Note that the results between the main regressions and the event-studies need not be exactly equal, as we consider different samples (never changers) for the event studies, we control for the euro amount bonus in the event studies, and the TWFE model with a homogeneous treatment parameter may implicitly weight

To summarize, the intensive margin results show that the exclusivity policy (b_1 bonus) had a perverse effect: it actually led to a decrease in public hours and a positive wage response from the private sector. On the other hand, we find that the equilibration policy of raising the b_2 dual bonus does not have a significant effect on the physician labor supply and, therefore, may not fully reverse the negative effects of the offsetting bonus.

5. Conclusion

Most nations around the world feature a publicly-financed base health care system for their residents, with private services used by many as a supplement to the public system. This "dual" system has been criticized on equity grounds, with one country (Canada) going so far as to ban private care. Such criticisms led Spain to introduce a bonus for workers to focus exclusively on the public system.

We show in this paper that Spain's policy solution backfired. While it did lead to a sizeable rise in physicians working exclusively in the public sector, it also had a large income effect on their labor supply. The result was a reduction in the hours of labor supply provided to the public sector – and overall.

To estimate the potential cost of implementing this exclusivity incentive, we conduct the following back-of-the-envelope calculation: we multiply the annual number of registered doctors per region and year (National Institute of Statistics, INE) by our sample share of public only doctors in each region-year and the annual value of the exclusivity bonus (if it was in place). We then add the total regional costs and calculate the average annual cost of the exclusivity policy for our sample period in Spain. We compare it to the average total public healthcare spending during our time period (OECD, 2025). While this policy may not have increased labor supply to the public sector, it did significantly raise health care cost 1.5% of total public health spending per year.[21]

Perhaps in reaction to this behavioral response, most regions in Spain added a (fully or partially) offsetting bonus for workers who work in both the public and private sectors. This did not solve the problem, however. There was not a meaningful rise in participation in the "dual" sector, hours of work did not change meaningfully, and adding this bonus increased

some post-treatment periods more than others, whereas the reported aggregated ATT in the event-study estimates takes a simple average.

[21] For each autonomous community and each year from 2003 to 2017, we multiply the annual exclusivity bonus amount by the estimated number of public-only doctors. The latter is obtained by multiplying the total number of registered doctors reported by the INE (National Institute of Statistics) by the share of public-only health professionals in our sample. Summing these region–year costs over the whole period and dividing the result by the cumulative public healthcare spending for 2003–2017 (OECD, 2025) yields 1.5 %.

costs by another 0.12%.[22]

These findings provide important lessons for nations struggling with the proper rate of private care in their public systems. It is important to consider the full impact of any financial incentive changes on, not only participation, but intensive labor supply. And, ironically, adding offsetting financial incentives may not solve the problem, but just add more cost.

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Figures and Tables

Figure 1: Bonus amounts by Region and Year.

Notes: Each panel show the exclusivity bonus (b_1) and the offsetting dual bonus (b_2) euro amounts by region over the period 2013-2017. Data on bonus amounts comes from regional physician unions. For 2003-2008 from the *Sindicato de Granada*, for 2009-2012 from the *Sindicato de Navarra*, and from 2013 onward from each regional union if available, or imputed using the last known amount.

Table 1: MCVL Descriptive Statistics

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mean Age	37.1	37.4	37.7	38.1	38.6	39.0	39.6	40.1	40.7	41.2	41.7	42.0	42.3	42.7	43.0
Share Male (%)	32.7	32.3	32.1	31.5	31.0	30.7	30.6	30.3	30.0	29.9	29.6	29.4	29.2	29.1	29.0
Workers (#)	20,206	21,088	22,064	23,817	25,431	26,052	26,375	26,765	27,270	27,245	27,324	27,612	28,055	28,285	28,569
Public (%)	49.9	48.6	47.2	47.8	48.9	48.8	50.8	51.0	51.4	51.7	50.4	49.6	49.3	49.2	50.5
Private (%)	42.4	43.4	44.8	43.1	41.0	41.9	40.4	40.7	41.0	42.7	43.3	43.2	42.9	43.1	41.1
Pub–Priv (%)	7.7	8.1	8.0	9.1	10.1	9.3	8.8	8.3	7.6	5.6	6.3	7.2	7.8	7.7	8.4
Movers (Dual → Pub)		359	446	407	505	723	648	565	487	496	300	370	409	544	484
CB Pub (€)	13517.2	14052.2	14361.4	15529.9	17396.4	17992.4	18931.9	18860.4	18911.9	18361.4	18557.1	18924.4	18957.7	19034.0	19691.7
CB Priv (€)	5494.9	5915.7	6345.6	6679.1	6948.2	7747.0	7869.7	8052.4	8106.0	8206.3	8332.3	8929.3	9186.7	9472.4	9444.3
CB Tot (€)	19012.2	19967.9	20707.0	22208.9	24344.6	25739.4	26801.6	26912.8	27017.9	26567.7	26889.3	27853.7	28144.4	28506.4	29136.0
Pub Sal (€)				21323.0	24477.4	27050.6	29441.6	28261.8	30398.6	25786.5	28304.6	25446.5	26273.0	26479.8	27164.8
Priv Sal (€)				7946.1	8617.7	9527.6	9196.1	9317.6	10122.9	8154.9	10435.3	9136.0	9340.6	9385.3	9760.7
Tot Sal (€)				29269.2	33095.0	36578.2	38637.7	37579.4	40521.5	33941.5	38739.9	34582.4	35613.6	35865.1	36925.5
b_1 (€)	821.2	842.1	879.5	892.1	773.4	821.7	841.7	809.1	808.6	815.1	812.4	812.1	813.7	818.4	822.4
b_2 (€)	880.3	814.5	698.6	776.9	758.9	839.5	903.4	871.4	866.8	869.1	867.6	866.6	879.2	882.3	883.0

Notes: Created using an unbalanced sample of workers from the MCVL restricted to workers with a health care professional job. Averages for b_1 and b_2 are computed only for regions where the corresponding bonus is in effect. Contribution Base (CB) and salary averages are calculated over the full sample, assigning zeros to workers not employed in a given sector (public or private). Pub, Priv and Tot denote respectively public, private and total.

Table 2: EPA Descriptive Statistics

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Pub Hours	25.48	25.93	25.46	24.64	25.12	25.29	24.97	25.60	25.27	24.85	24.29
Priv Hours	10.37	10.00	10.23	10.68	10.32	10.04	10.32	10.21	10.32	10.62	11.00
Total Hours	35.85	35.93	35.68	35.32	35.44	35.33	35.29	35.81	35.59	35.47	35.28
Mean Age	42.50	43.24	43.39	43.72	44.13	44.61	45.28	45.73	45.82	46.16	46.63
Share Male (%)	26.15	25.27	25.67	25.72	26.00	26.44	27.90	26.77	26.80	25.86	27.21
Workers (#)	3,205	3,367	3,608	3,483	3,561	3,669	3,556	3,474	3,589	3,534	3,642

Notes: Created using a sample from the EPA restricted to health care professionals. Average hour values are calculated in the whole sample of workers, with zeros if a worker does not work a certain job type (public/private).

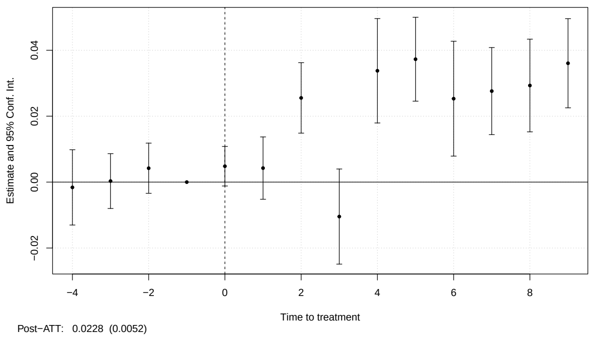
Table 3: Bonus Effect on Dual Practice by Sector (2003–2017)

	Health Professionals		Education Professionals	
	(1)	(2)	(1)	(2)
	Status	Status	Status	Status
Exclusivity (0/1)	0.0185***		-0.0095	
	(0.00478)		(0.01287)	
Offsetting (0/1)	0.0105		-0.0009	
	(0.00616)		(0.01059)	
Exclusivity (thousand €)		0.0381***		-0.0163
		(0.01057)		(0.03812)
Offsetting (thousand €)		0.0042		0.0133
		(0.00785)		(0.01793)
Observations	222,434	222,434	100,043	100,043
Mean of Status	0.862		0.810	

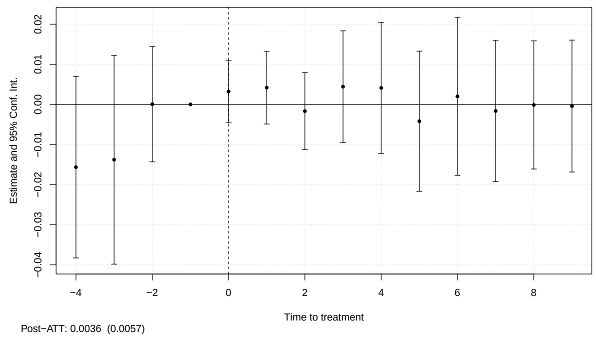
Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions of the public-only status indicator on the bonus indicators (0/1) and the bonus euro amounts (in thousands). Observations are at the worker-year level for the sample of public-only or dual health professionals for columns (1) and (2), and education professionals for columns (3) and (4) from the MCVL panel database. All regressions include region and year fixed effects and the following controls: age, gender, GDP per capita, unemployment rate, public deficit (% of GDP), number of hospital beds/1,000 people and th e share of population aged 65+ for the health professionals, and the share of population below the age of 24 for the education professionals. Standard errors clustered at the regional level.

Figure 2: Event Studies for Dual Practice.



(a) b_1 bonus



(b) b_2 bonus

(c) b_1 SDID (ATT: 0.026)

Notes: Panel (a) and (b) show the event-study estimates for the effect of the b_1 and b_2 bonus on the public-only share among public-only and dual workers controlling for the other bonus. The estimator used is the Sun and Abraham (2021) imputation estimator with the same controls and fixed effects as for the regression specifications in Table 3. Panel (c) replicates panel (a) using the Synthetic Differences-in-Differences estimator of Arkhangelsky et al. (2021). The plot shows the trajectory of public-only share for the treated unit (blue) and synthetic control unit (red) before and after the start of treatment (dashed line). For all estimates the control group is the set of never-changer CCAA; estimates for other control groups are reported in the Appendix Figure A.1. Standard errors are clustered at the region level.

Table 4: Health Prof: Bonuses Effect on Regular Hours (2006–2016)

	(1) Pub hrs	(2) Priv hrs	(3) Total hrs	(4) Pub hrs	(5) Priv hrs	(6) Total hrs
Exclusivity (0/1)	-1.800***	0.582	-1.218***			
	(0.581)	(0.631)	(0.248)			
Offsetting (0/1)	0.281	0.290	0.572			
	(0.887)	(0.915)	(0.354)			
Exclusivity (thousand €)				-2.734	-0.366	-3.100***
				(2.051)	(2.162)	(0.881)
Offsetting (thousand €)				2.066**	-0.868	1.198***
				(0.809)	(0.773)	(0.343)
Observations	37,287	37,287	37,287	37,287	37,287	37,287
Mean Hours	25.161	10.377	35.538	25.161	10.377	35.538

Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions of weekly regular hours on the bonus indicators (0/1) and the bonus euro amounts (in thousands). The dependent variable is public weekly hours for columns (1) and (4), private weekly hours for columns (2) and (5), and total weekly hours for columns (3) and (6). Observations are at the worker-year level for the sample of education professionals from the EPA repeated cross-sections database. All regressions include region and year fixed effects and controls: age, gender, GDP per capita, unemployment rate, public deficit (% of GDP), number of hospital beds per 1,000 people, and the share of population aged 65 or above. Standard errors clustered at the regional level.

Table 5: Education Prof: Bonuses Effect on Regular Hours (2006–2016)

	(1) Pub hrs	(2) Priv hrs	(3) Total hrs	(4) Pub hrs	(5) Priv hrs	(6) Total hrs
Exclusivity (0/1)	0.835	-0.511	0.323			
	(0.567)	(0.524)	(0.267)			
Offsetting (0/1)	-1.630***	0.644	-0.986*			
	(0.485)	(0.592)	(0.483)			
Exclusivity (thousand €)				-0.811	1.041	0.230
				(3.020)	(2.005)	(1.399)
Offsetting (thousand €)				-0.781	0.559	-0.222
				(0.701)	(0.538)	(0.567)
Observations	23,078	23,078	23,078	23,078	23,078	23,078
Mean Hours	27.577	6.677	34.254	27.577	6.677	34.254

Notes: Regressions of weekly regular hours on the bonus indicators (0/1) and the bonus euro amounts (in thousands). The dependent variable of interest is public weekly hours for columns (1) and (4), private weekly hours for columns (2) and (5) and total weekly hours for columns (3) and (6). Observations are at the worker-year level for the sample of education professionals from the EPA repeated cross-sections database. All regressions include region and year fixed effects and the following controls: age, gender, GDP per capita, unemployment rate, public deficit (% of GDP) and the share of population aged 24 or below. Standard errors clustered at the regional level.

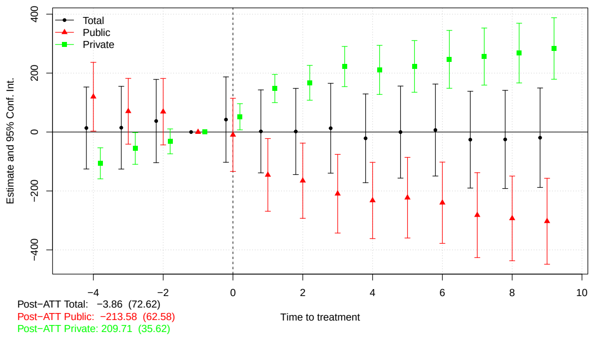
Table 6: Bonuses Effect on Contribution Base

	(1) Pub BC	(2) Priv BC	(3) Total BC	(4) Pub BC	(5) Priv BC	(6) Total BC
Exclusivity (0/1)	-177.2***	152.1***	-25.1			
	(42.4)	(36.3)	(32.3)			
Pub–Priv (0/1)	-18.1	-96.9***	-115.0***			
	(29.6)	(29.0)	(31.8)			
Exclusivity €				-363.7***	110.7	-252.9**
				(102.3)	(113.9)	(94.5)
Pub–Priv €				60.2	-145.9**	-85.8**
				(58.0)	(68.5)	(37.9)
Observations	367,223	367,223	367,223	367,223	367,223	367,223
Mean BC	1083.16	660.67	1743.82	1083.16	660.67	1743.82

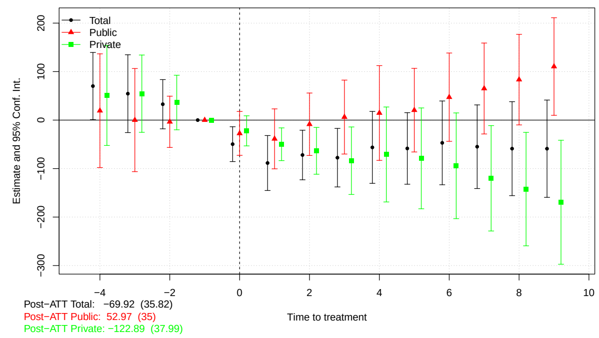
Standard errors in parentheses.* p <0.1, ** p <0.05, *** p <0.01.

Notes: Regressions of the contribution base monthly earnings proxy (net of bonuses) on the bonus indicators (0/1) and the bonus euro amounts (in thousands). The dependent variable of interest is public monthly earnings for columns (1) and (4), private monthly earnings for columns (2) and (5) and total monthly earnings for columns (3) and (6). Observations are at the worker-year level for the sample of health professionals from the MCVL panel database. All regressions include worker and year fixed effects and the following controls: GDP per capita, unemployment rate, public deficit (% of GDP), number of hospital beds/1,000 people, and the share of population aged 65+. Standard errors clustered at the regional level.

Figure 3: Event Studies for Salary Regressions.



(a) b_1 bonus



(b) b_2 bonus

Notes: Panel (a) and (b) show the event-study estimates for the effect of the b_1 and b_2 bonus on the contribution-based earnings measure for public earnings, private earnings and total earnings (net of bonuses). The estimator used is the Abraham and Sun (2021) imputation estimator with the same controls and fixed effects as for the regression specifications in Table 6. Standard errors are clustered at the region level.

Appendix

A.1. Additional Figures and Tables

Table A.1: Bonus Amounts (2003–2017)

Exclusivity bonus (b_1)															
Region	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Andalusia	759.22	774.41	789.90	805.70	821.81	838.25	857.59	814.71	814.71	814.71	814.71	814.71	814.71	822.85	831.09
Aragon	732.36	747.01	761.95	672.63	562.92	551.58	557.54	511.09	511.09	511.09	511.09	511.09	511.09	511.09	511.09
Asturias	732.36	747.01	761.95	777.19	1,161.28	1,184.51	1,211.82	1,167.59	1,167.59	1,167.59	1,167.59	1,167.59	1,167.59	1,179.27	1,191.06
Balearic Islands	732.36	1,146.34	1,162.97	1,192.65	1,216.54	1,234.19	1,277.97	1,214.12	1,214.12	1,224.12	1,224.12	1,224.12	1,224.12	1,224.12	1,224.12
Canary Islands	732.36	733.65	748.32	763.30	778.58	794.16	810.06	782.53	782.53	782.53	782.53	782.53	782.53	782.53	782.53
Cantabria	732.36	747.01	761.96	777.20	825.78	808.61	827.27	785.91	785.91	785.91	785.91	785.91	785.91	785.91	785.91
Castile and Leon	732.36	747.01	761.95	777.20	792.75	808.61	819.02	786.26	786.26	786.26	786.26	786.26	786.26	786.26	786.26
Castile-La Mancha	732.36	747.01	761.96	777.20	825.78	828.12	847.24	815.05	815.05	815.05	815.05	815.05	815.05	815.05	815.05
Catalonia	0.00	0.00	0.00	0.00	212.68	348.51	355.49	337.72	337.72	337.72	337.72	337.72	337.72	341.10	344.52
Valencia	1,296.86	1,254.00	1,279.08	1,304.66	1,332.27	1,358.92	1,390.26	1,345.77	1,345.77	1,345.77	1,345.77	1,345.77	1,345.77	1,345.77	1,345.77
Extremadura	732.36	757.43	783.21	809.87	886.31	981.08	1,032.50	981.37	981.37	981.37	981.37	981.37	981.37	991.17	991.17
Galicia	719.26	733.65	748.32	763.29	778.56	794.13	812.44	779.94	779.94	779.94	779.94	779.94	779.94	787.74	787.74
Madrid	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Murcia	732.36	747.01	1,162.82	1,186.08	1,277.01	1,328.10	1,438.14	1,385.65	1,398.63	1,398.63	1,398.63	1,398.63	1,398.63	1,398.63	1,398.63
Navarre	742.36	763.15	788.33	817.50	856.18	956.54	978.60	913.03	913.03	913.03	913.03	913.03	913.03	922.10	931.38
Basque Country	774.19	795.88	814.18	830.47	895.34	923.87	924.82	924.82	887.36	887.36	887.36	887.36	887.36	887.36	887.36
La Rioja	961.86	1,054.57	1,075.66	1,097.17	1,169.83	1,119.41	1,194.23	1,134.85	1,134.85	1,134.85	1,134.85	1,134.85	1,134.85	1,134.85	1,134.85
Offsetting Bonus (b_2)															
Region	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Andalusia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aragon	0.00	0.00	374.33	381.82	368.96	357.62	348.35	311.90	311.90	311.90	311.90	311.90	311.90	311.90	311.90
Asturias	0.00	0.00	0.00	0.00	382.74	390.39	399.39	384.81	384.81	384.81	355.00	355.00	355.00	358.55	362.14
Balearic Islands	0.00	1,146.34	1,162.97	1,192.65	1,216.54	1,234.19	1,277.97	1,214.12	1,214.12	1,224.12	1,224.12	1,224.12	1,224.12	1,224.12	1,224.12
Canary Islands	0.00	0.00	347.31	763.30	778.58	794.16	810.06	782.53	782.53	782.53	782.53	782.53	782.53	782.53	782.53
Cantabria	0.00	0.00	0.00	0.00	257.65	404.35	406.46	366.94	366.94	366.94	366.94	366.94	785.91	785.91	785.91
Castile and Leon	0.00	0.00	761.95	777.20	792.75	808.61	819.02	786.26	786.26	786.26	786.26	786.26	786.26	786.26	786.26
Castile-La Mancha	0.00	0.00	0.00	0.00	825.78	828.12	847.24	815.05	815.05	815.05	815.05	815.05	815.05	815.05	815.05
Catalonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Valencia	1,075.35	1,050.00	1,071.00	1,092.00	1,117.67	1,140.08	1,166.31	1,128.99	1,128.99	1,128.99	1,128.99	1,128.99	1,128.99	1,128.99	1,128.99
Extremadura	0.00	0.00	0.00	0.00	439.79	924.78	993.41	943.74	943.74	943.74	943.74	943.74	943.74	953.18	953.18
Galicia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Madrid	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Murcia	0.00	365.56	400.87	408.89	1,277.01	1,328.10	1,438.14	1,385.65	1,398.63	1,398.63	1,398.63	1,398.63	1,398.63	1,398.63	1,398.63
Navarre	181.47	186.55	192.70	199.83	209.28	313.30	320.52	299.05	299.05	299.05	299.05	299.05	299.05	302.03	305.05
Basque Country	0.00	0.00	0.00	0.00	295.47	557.14	924.82	924.82	887.36	887.36	887.36	887.36	887.36	887.36	887.36
La Rioja	225.00	307.56	313.71	329.15	760.40	1,119.41	1,194.23	1,134.85	1,134.85	1,134.85	1,134.85	1,134.85	1,134.85	1,134.85	1,134.85

Notes: Each panel shows the exclusivity bonus (b_1) and the offsetting dual bonus (b_2) euro amounts for each region and year from 2003 to 2017. Data on bonus amounts comes from regional physician unions. For 2003–2008 from the *Sindicato de Granada*, for 2009–2012 from the *Sindicato de Navarra*, and from 2013 onward from each regional union if available, or imputed using the last known amount.

Table A.2: Health and Educ Prof: Bonus Effect on Dual Practice (2003–2017)

	Health Professionals			Education Professionals		
	(1)	(2)	(3)	(4)	(5)	(6)
	status	status	status	status	status	status
Exclusivity (0/1)	0.0185***			-0.0095		
	(0.00478)			(0.01287)		
Offsetting (0/1)	0.0105			-0.0009		
	(0.00616)			(0.01059)		
Exclusivity (thousand €)		0.0381***			-0.0163	
		(0.01057)			(0.03812)	
Offsetting (thousand €)		0.0042			0.0133	
		(0.00785)			(0.01793)	
Exclusivity CB 2003			0.0776***			-0.0255
			(0.02234)			(0.06301)
Offsetting CB 2003			0.0087			0.0137
			(0.01655)			(0.03139)
Age	0.0078***	0.0078***	0.0078***	0.0043***	0.0043***	0.0043***
	(0.00034)	(0.00034)	(0.00034)	(0.00095)	(0.00095)	(0.00095)
Male	-0.0537***	-0.0536***	-0.0536***	-0.0642***	-0.0641***	-0.0642***
	(0.00674)	(0.00675)	(0.00675)	(0.00770)	(0.00772)	(0.00772)
GDP/capita (thousand €)	0.0018	0.0020	0.0020	0.0048	0.0048	0.0048
	(0.00130)	(0.00137)	(0.00137)	(0.00519)	(0.00519)	(0.00520)
Unemployment rate	0.0085	-0.0092	-0.0091	0.2094*	0.2155**	0.2095*
	(0.07316)	(0.07221)	(0.07227)	(0.10528)	(0.10007)	(0.10402)
Public deficit (% GDP)	0.0013*	0.0013*	0.0013*	-0.0022	-0.0022	-0.0022
	(0.00063)	(0.00062)	(0.00062)	(0.00154)	(0.00161)	(0.00159)
Population aged 65+ (%)	0.4875	0.2801	0.2796			
	(0.29940)	(0.33026)	(0.33163)			
Population aged -24 (%)				-0.1075	-0.1741	-0.1743
				(0.80040)	(0.77701)	(0.77230)
Hospital beds per 1,000	-0.0247	-0.0363**	-0.0365**			
	(0.01591)	(0.01452)	(0.01467)			
Observations	222,434	222,434	222,434	100,043	100,043	100,043
Mean of Status	0.862			0.810		

Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions of the public-only status indicator on the bonus indicators (0/1), the bonus euro amounts (in thousands) and the bonus amount divided by the average public earnings (contribution base proxy) for each region in the base year (CB 2003). Observations are at the worker-year level for the sample of public-only and dual health professionals (columns 1-3) and education professionals (columns 4-6) from the MCVL panel database. All regressions include region and year fixed effects. Standard errors clustered at the regional level.

Table A.3: Health Prof: Bonus effect on Dual Practice (2006–2017)

	(1) Status	(2) Status
Exclusivity (0/1)	0.0176**	
	(0.00608)	
Offsetting (0/1)	0.0003	
	(0.00963)	
Exclusivity (thousand €)		0.0638***
		(0.01666)
Offsetting (thousand €)		-0.0107
		(0.01216)
Observations	187,060	187,060
Mean of Status	0.862	

Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions of the public-only status indicator on the bonus indicators (0/1) and the bonus euro amounts (in thousands). Observations are at the worker-year level for the 2006–2017 sample of public-only and dual health professionals from the MCVL panel database. All regressions include region and year fixed effects and the following controls: age, gender, GDP per capita, unemployment rate, public deficit (% of GDP), number of hospital beds/1,000 people, and the share of population aged 65+. Standard errors clustered at the regional level.

Table A.4: Bonuses Effect on Salaries (2006–2017)

	(1) Pub Sal	(2) Priv Sal	(3) Total Sal	(4) Pub Sal	(5) Priv Sal	(6) Total Sal
Exclusivity (0/1)	-213.49**	141.40**	-72.09			
	(92.77)	(57.79)	(81.11)			
Pub–Priv (0/1)	28.68	-77.07*	-48.39			
	(38.97)	(37.74)	(48.19)			
Exclusivity €				-363.62**	162.40	-201.22
				(155.69)	(141.74)	(179.81)
Pub–Priv €				154.44	-131.19*	23.24
				(94.64)	(74.34)	(79.61)
Observations	268,541	268,541	268,541	268,541	268,541	268,541
Mean Salary (€)	1781.26	776.03	2557.29	1781.26	776.03	2557.29

Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions of tax-based monthly earnings (net of bonuses) on bonus indicators (0/1) and bonus euro amounts (thousands). Dependent variables: public (columns 1,4), private (columns 2,5), and total (columns 3,6) monthly earnings. Sample: worker-year observations for health professionals (2006–2017) from the MCVL panel. All regressions include worker and year fixed effects and controls: GDP per capita, unemployment rate, public deficit (% of GDP), hospital beds per 1,000 people, and share aged 65+. Standard errors clustered at the regional level.

Table A.5: Education: Bonuses Effect on Contribution Base (2003–2017)

	(1) Pub BC	(2) Priv BC	(3) Total BC	(4) Pub BC	(5) Priv BC	(6) Total BC
Exclusivity (0/1)	-1.94	12.48	10.54			
	(51.45)	(51.36)	(24.15)			
Pub–Priv (0/1)	87.70	-80.07	7.63			
	(70.65)	(52.83)	(26.34)			
Exclusivity €				10.75	-40.27	-29.52
				(131.49)	(113.44)	(60.99)
Pub–Priv €				222.30**	-150.53**	71.76*
				(87.85)	(62.64)	(37.43)
Observations	147,261	147,261	147,261	147,261	147,261	147,261
Mean CB (€)	1248.61	1062.02	2310.64	1248.61	1062.02	2310.64

Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions of tax-based monthly earnings (net of bonuses) on bonus indicators (0/1) and bonus euro amounts (thousands). Dependent variables: public (columns 1, 4), private (columns 2, 5), and total (columns 3, 6) monthly earnings. Sample: worker-year observations for health professionals (2003–2017) from the MCVL panel. All regressions include worker and year fixed effects and controls: GDP per capita, unemployment rate, public deficit (% of GDP) and share aged 24 or below. Standard errors clustered at the regional level.

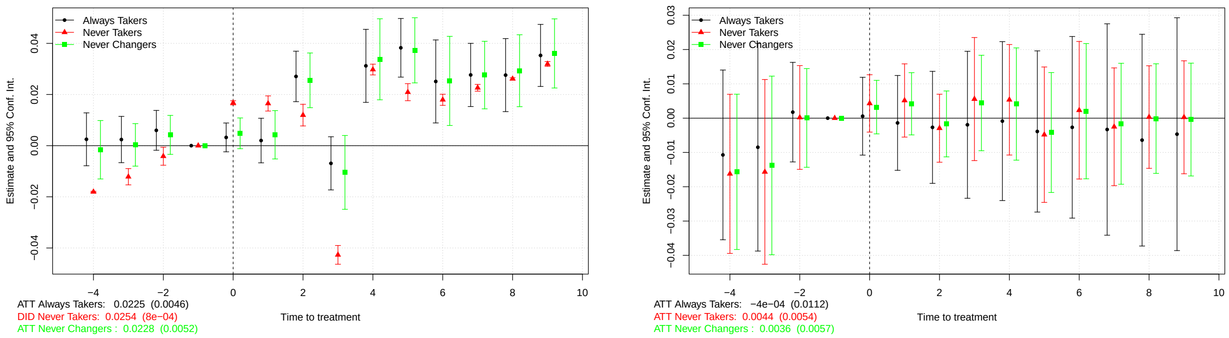
Table A.6: Bonuses Effect on Contribution Base (Region-Year FEs)

	(1) Pub BC	(2) Priv BC	(3) Total BC	(4) Pub BC	(5) Priv BC	(6) Total BC
Exclusivity (0/1)	-279.56***	203.37***	-76.19***			
	(62.63)	(56.10)	(24.05)			
Offsetting (0/1)	-104.78*	-5.87	-110.64**			
	(50.62)	(60.19)	(39.48)			
Exclusivity (thousand €)				-713.88***	243.94	-469.93***
				(108.34)	(168.51)	(96.82)
Offsetting (thousand €)				12.12	-113.14	-101.03**
				(44.70)	(70.82)	(39.26)
Observations	366,905	366,905	366,905	366,905	366,905	366,905
Mean BC	1083.20	661.37	1744.57			

Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions of the contribution base monthly earnings proxy (net of bonuses) on bonus indicators (0/1) and euro amounts (in thousands). Dependent variables: public (columns 1,4), private (columns 2,5), and total (columns 3,6) monthly earnings. Observations are at the worker-year level for health professionals from the MCVL panel database. All regressions include region and year fixed effects and controls: age, gender, GDP per capita, unemployment rate, public deficit (% of GDP), hospital beds per 1,000 people, and the share aged 65+. Standard errors clustered at the regional level.

Figure A.1: Event Studies for Status [all control groups].

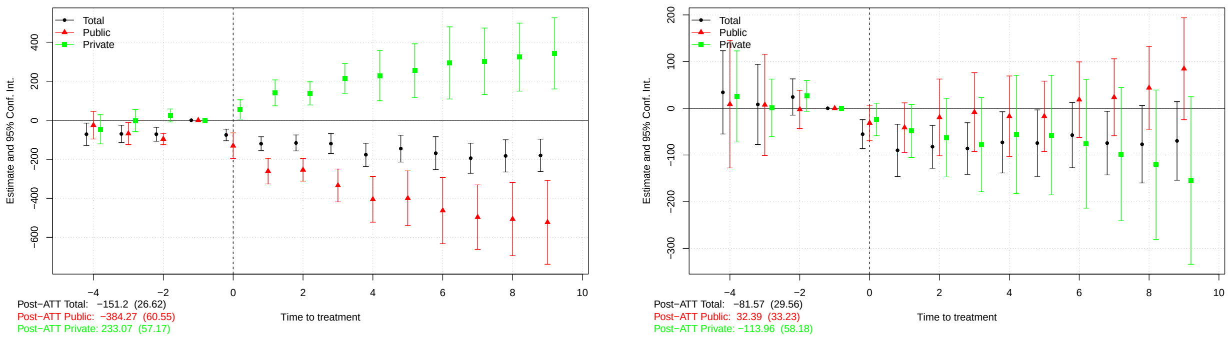


(a) b_1 bonus

(b) b_2 bonus

Notes: Panel (a) and (b) show the event-study estimates for the effect of the b_1 and b_2 bonus on the public-only share among public-only and dual workers controlling for the other bonus. The estimator used is the Abraham and Sun (2021) imputation estimator with the same controls and fixed effects as for the regression specifications in Table 3. Three control groups are displayed in accordance to our event-study design methodology described in section 4: the never takers that never receive the treatment, the always takers that have the treatment before the sample starts and the never changers which are the union of the two. For panel (a) there is only one never taker, Madrid, that never has the b_1 bonus, and only one cohort unit that receives the treatment, Catalonia. Given the set of controls and event-study indicators the regression in panel (a) suffers from multi-col-linearity. To avoid the col-linearity problem we report the estimates using only individual level controls and region-year fixed effects, and report the standard DiD estimate (estimated by running a regression on the treatment indicator with two-way fixed effects).

Figure A.2: Event Studies for Salary Regressions (Region FEs).



(a) b_1 bonus

(b) b_2 bonus

Notes: Panel (a) and (b) show the event-study estimates for the effect of the b_1 and b_2 bonus on the contribution-based earnings measure for public earnings, private earnings and total earnings (net of bonuses). The estimator used is the Abraham and Sun (2021) imputation estimator with the same controls as for the regression specifications in Table 6 and Figure 3 but with region and year fixed effects. Standard errors are clustered at the region level.

A.1.1. Results for Private Transitions

In the main text we consider the extensive margin moves to public-only jobs by dual practitioners. As we note in the theory section, however, it is also possible for the bonuses to affect the incentives of workers in the private sector, either directly by changing monetary incentives or indirectly through GE effects (as we explore later in the appendix and in the last part of Section 4).

Table A.7 replicates our main specification in Table 3, but for the private-only share among private and dual workers. It shows that we find no statistically significant effects of the bonuses on the private-only share of workers. Furthermore, the event studies in Figure A.3 also shows that there is no statistically significant treatment effect of either bonus on the private-only share. The coefficient estimates are moderate in magnitude and generally positive for the b_1 bonus, potentially indicating a positive GE private sector reaction (as we discuss in Section 4 when evaluating our salary measure results). However, as Panel (a) in Figure A.3 suggests they are not dissimilar from the pre-treatment coefficients, indicating that they might be due to unobserved factors and not directly caused by the exclusivity bonus.

Table A.7: Bonus effect for Health Professionals [Private-only and Public-Private]

	2003-2017		2006-2017	
	(1)	(2)	(1)	(2)
	Status	Status	Status	Status
Exclusivity (0/1)	0.026		0.025	
	(0.025)		(0.016)	
Offsetting (0/1)	0.021		0.035	
	(0.023)		(0.021)	
Exclusivity (thousand €)		0.029		0.057
		(0.046)		(0.044)
Offsetting (thousand €)		-0.003		0.013
		(0.023)		(0.017)
Observations	193,343	193,343	161,098	161,098
Mean of Status	0.841	0.841	0.840	0.840

Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: Regressions of the private-only status indicator on the bonus indicators (0/1) and the bonus euro amounts (in thousands). Observations are at the worker-year level for the sample of private-only or dual health professionals (columns 1-2) and education professionals (columns 3-4) from the MCVL panel database. All regressions include region and year fixed effects and the following controls: age, gender, GDP per capita, unemployment rate, public deficit (% of GDP), number of hospital beds/1,000 people, and the share of population aged 65+. Standard errors clustered at the regional level.

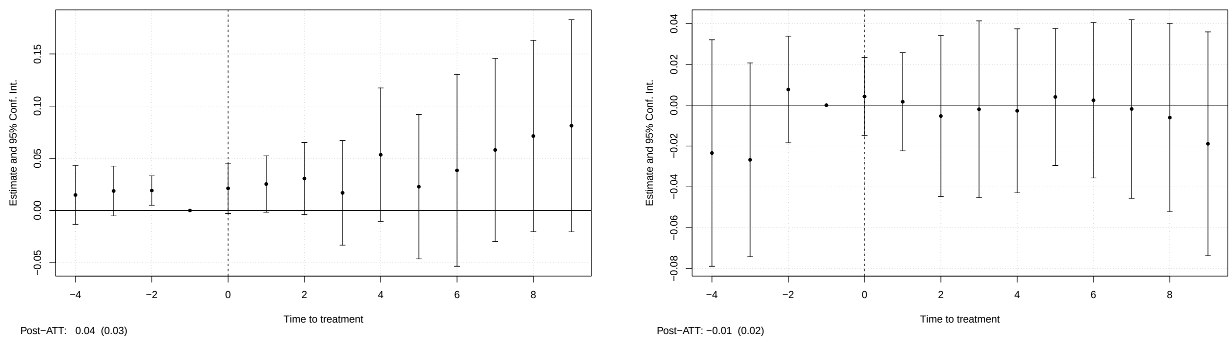
A.2. Proof of Result 1

Recall the inequality condition for the corner solution of exclusivity:

$$\left(\frac{\gamma_1 - h_1^*}{\gamma_1 - h_1^E}\right)^{\alpha_1}\left(\frac{\gamma_2 - h_2^*}{\gamma_2}\right)^{\alpha_2} \leq \left(\frac{w_1 h_1^E + b_1}{w_1 h_1^* + w_2(a) h_2^* + b_2}\right)^{1-\alpha_1-\alpha_2}$$

To show Result 1 formally denote by $\mathcal{M}(b_1, b_2)$ the set of doctors with characteristics and preferences such that the exclusivity utility conditions is satisfied and consider two bonuses $b_1 < b_1'$. It follows that if a doctor belongs to $\mathcal{M}(b_1, b_2)$ then it will also belong to $\mathcal{M}(b_1', b_2)$, and, therefore, that $\mathcal{M}(b_1, b_2) \subseteq \mathcal{M}(b_1', b_2)$ which implies that $s(b_1, b_2) \equiv \mathbb{P}_F(\mathcal{M}(b_1, b_2)) \leq$

Figure A.3: Event Studies for Public-Private and Private-only transitions.



(a) Private-dual (b_1)

(b) Private-dual (b_2)

Notes: Replication of Figure A.3 panels (a) and (b) for transitions from public-private to private-only. In this case, only workers with a private job are considered and the outcome variable of interest is the private-only indicator.

$\mathbb{P}_F(\mathcal{M}(b_1', b_2)) = s(b_1', b_2)$. A similar argument shows that the share $s(b_1, b_2)$ is decreasing in b_2. To see this, note that the RHS is increasing in b_2 as h_2^* is decreasing in b_2 and so $\gamma_2 - h_2^*$ is increasing in b_2, and the LHS is decreasing in b_2 as $w_2(a)h_2^* + b_2$ is increasing in $b_2(1-\alpha_2)$.

A.3. Theory simulations and bonus equalization

In the theory section we discuss that raising the b_1 and b_2 bonus does not have a symmetric effect as different groups of workers are targeted and workers may have different preferences across jobs. In particular, we highlight that workers that decide to become public-only when b_1 is increased may not switch back to dual practice when b_2 is increased to match b_1. Beyond behavioral reasons or CCAA specific reasons[23] doctors may decide to not switch back because of the bonuses income effect' forcing them to stay in the corner solution even after equalization.

Mathematically, the different impacts of the bonus can be seen in the inequality condition

[23]For example, Aragon and Valencia phase out exclusivity by creating new types of contracts for new workers with similar b_1 and b_2 bonuses. However, workers that already have the exclusivity contract before the policy change can choose to remain in their old contract. While the new and old contracts have, in general, very similar b_1 bonuses (meaning that the monetary incentives for exclusivity are similar), it is likely that some workers may decide to remain exclusive to maintain the old contract to which they would not be able to switch back if they chose to became dual practitioners.

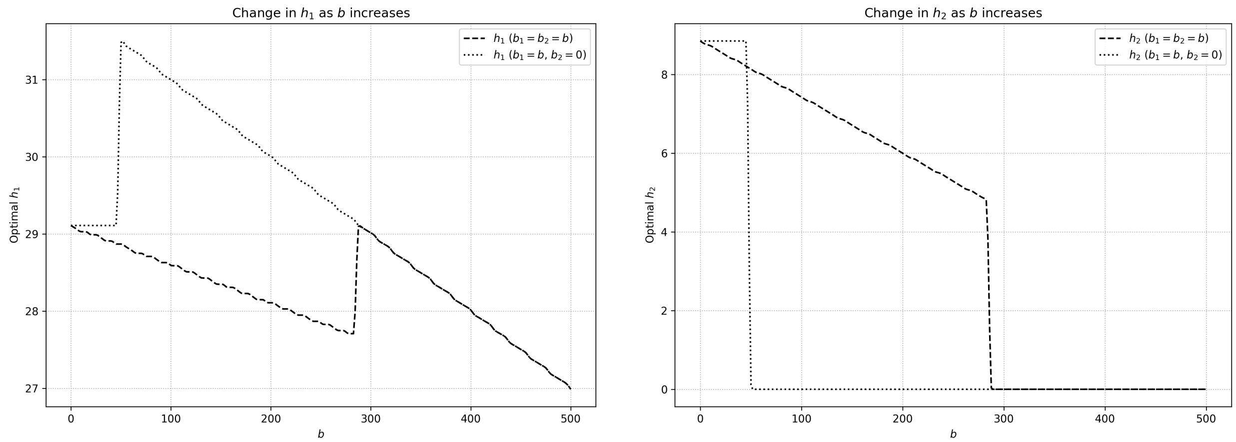
for the corner solution of exclusivity:

$$\left(\frac{\gamma_1 - h_1^*}{\gamma_1 - h_1^E}\right)^{\alpha_1}\left(\frac{\gamma_2 - h_2^*}{\gamma_2}\right)^{\alpha_2} \leq \left(\frac{w_1 h_1^E + b_1}{w_1 h_1^* + w_2(a) h_2^* + b_2}\right)^{1-\alpha_1-\alpha_2}.$$

Increasing b_1 raises the RHS proportionally to $\frac{\alpha_1}{w_1(1-\alpha_2)}$ from the effect on h_1^E and $1 - \alpha_1/(1-\alpha_2)$ from the effect on income. Increasing b_2 on the other hand raises the LHS proportionally to α_1/w_1 for h_1^*, α_2/w_2 for h_2^* and $(1-\alpha_1-\alpha_2)$ for income. A corner solution can happen when the inequality holds, but also when the income effect induced by b_2 on h_2^* is large enough that, given the preferences of the doctor, it choose to not provide any private labor supply. This phenomenon will be more likely when b_2 is large and the dis-utility of the private job is large ($\alpha_2 > \alpha_1$).

For example, consider a setting, similar to our empirical framework, in which $w_1 = 20$, $w_2 = 35$, $\alpha_1 = 0.1$, $\alpha_2 = 0.5$, $c = 20$. That is, a case in which the doctor has a preference for the public job (for example because of better training), but the private hours pay more and there is a positive cost of switching to the private sector. Figure A.4 compares the case in which we only increase the exclusivity bonus b_1 with the case in which we equalize both bonuses and increase then ($b_1 = b_2$). As can be seen not only does the equalization matter, but also the amount to which we equalize the bonus. In particular, when we give a b_1 bonus greater than 300 (as is common in our sample), and no b_2 bonus, a dual doctor would decide to become exclusive and drop its private labor supply as seen by the light dashed line in panel (b). However, when the b_2 bonus is equalized to the amount of the b_1 bonus and now both bonuses are at 300 euros, the doctor does not switch back to private practice and remains in the exclusivity corner solution as can be seen by the dark dashed line. This is because at 300 euros the income effect on the optimal private labor supply is great enough that the doctor would choose to not provide any hours. This is an example of a case in which, without any additional behavioral frictions, a doctor that had decided to become public only does not switch back to dual practice when the bonuses are equalized.

Figure A.4: Simulations.



(a) h_1 (b) h_2

Notes: Panel (a) and (b) show simulations for the optimal h_1 and h_2 values using grid search for a model with the following paramteres: $\gamma_1 = \gamma_2 = 40$, $\alpha_1 = 0.1$, $\alpha_2 = 0.5$, $w_1 = 20$, $w_2 = 35$, $I = 0$, $c = 20$. Each panel shows the optimal labor supply amount for the case in which $b_1 = b$, $b_2 = 0$ vs. the case in which $b_1 = b_2 = b$.

A.4. General Equilibrium and Total Labor Supply

Consider the total labor supply in equilibrium for a mass of workers:

$$H^* = (h_1^* + h_2^*)s^{pubpriv} + h_1^E s^{pub} + h_2^{priv} s^{priv},$$

where s^{pub} denotes the measure of public only workers (which we labeled $s(b_1, b_2)$ above), $s^{pubpriv}$ the measure of public-private workers, s^{priv} the measure of private only workers and the hour terms are the respective equilibrium labor supplies of the representative workers. Here, we omit transitions from private-only as we do not expect these to be an important margin of adjustment. It follows that the partial equilibrium effect of a change in bonus b_1 leads to total labor supply change:

$$\frac{\partial H^*}{\partial b_1} = \underbrace{(h_2^*)\frac{\partial s^{pubpriv}}{\partial b_1}}_{\leq 0} + \underbrace{(h_1^E - h_1^*)\frac{\partial s^{pub}}{\partial b_1}}_{\geq 0} + \underbrace{\frac{\partial h_1^E}{\partial b_1}(s^{pub})}_{\leq 0},$$

where the first term denotes the change in the public-private share which leads to a drop in secondary job hours, the second term is the increase in hours by the movers and the final

term is the decrease in hours due to the income effect for the public-only workers. Overall, as noted in the discussion above, when s^{pub} is significantly greater than $s^{pubpriv}$ we may expect $\frac{\partial H^*}{\partial b_1}$ to be negative and, therefore, that a change in bonus Δb_1 leads to a decrease in total supply $\Delta H^* < 0$.
For the dual bonus, we can do a similar decomposition

$$\frac{\partial H^*}{\partial b_2} = \underbrace{(h_2^*)\frac{\partial s^{pubpriv}}{\partial b_2}}_{\geq 0} + \underbrace{(\frac{\partial h_1^*}{\partial b_2} + \frac{\partial h_2^*}{\partial b_2})s^{pubpriv}}_{\leq 0} + \underbrace{(h_1^* - h_1^E)\frac{\partial s^{pubpriv}}{\partial b_2}}_{\leq 0},$$

where the first term denotes the increase in private hours due to increasing dual job holding, the second term denotes the decrease in hours of dual job holders because of the IE and the third term denotes the decrease in public hours of the switchers to dual job holding. Overall, we expect the changes in total hours to be smaller than in the case of the exclusivity bonus b_1, given $s^{pubpriv}$ is smaller than s^{pub}, but the total hour change remains ambiguous in this case.

More generally, there are two mechanisms through which provider supply could adjust to meet inflexible demand. The first would be through expanded supply of positions in the public sector. Such a response, however, is unlikely to occur in the near term, for two reasons. First, public budgets, already under pressure from increased bonuses, are unlikely to allow higher wages that would be necessary to attract new physicians. Second, public physician positions are regulated on quantity as well, and there is a very slow process of approving new positions. In order to provide anecdotal evidence of this last, detailed information on the steps and dates of each process to hire new public sector positions is available in the webpage of the Spanish Ministry of Health. Some of these steps include the application phase, one or more exams and/or tests, interviews and the final ranking and hiring decision. By looking at the dates of each of these steps for a given position, we can observe that the entire process takes very long, typically from half a year to one year from the moment that the call is issued to the final resolution. Additionally, after that, there is still the contract preparation and signature process, which can take some more months [24]

The second would be through increased wages in the private sector. Wages can respond more flexibly in the private sector and there are few regulatory barriers to private physicians rapidly responding to such wage increases. As a result, this is more likely to be the margin of response.

[24]The steps of each of these processes as well as the specific dates, can be observed here https://www.sanidad.gob.es/profesionales/oposicionesConcursos/concursos/concurso.htm.

To incorporate this discussion in our model consider the total labor supply change with respect to b_1 when adjustments through private incentives ($w_2(a)$) are possible but not through public wages (w_1). Then, the labor supply change $\frac{\partial H^*}{\partial b_1}$ has additional terms:

$$\underbrace{\frac{\partial(h_1^* + h_2^*)}{\partial b_1}}_{\text{wage adjustment}} \frac{\partial s^{pubpriv}}{\partial b_1} + \underbrace{\frac{\partial h_2^{priv}}{\partial b_1} s^{priv} + h_2^{priv} \frac{\partial s^{priv}}{\partial b_1}}_{\text{private sector adjustment}},$$

where $\frac{\partial(h_1^*+h_2^*)}{\partial b_1} = \frac{\partial(h_1^*+h_2^*)}{\partial w_2(a)} \frac{\partial w_2(a)}{\partial b_1}$ is the supply adjustment due to the change in relative wages and the new term denotes the private response to the change in $w_2(a)$. Observe that this term could in principle be positive or negative depending on the IE and SE, and the preferences for each job. However, given that $s^{pubpriv}$ is small, we expect the contribution of this term to be small. Therefore, given a partial equilibrium effect such that $\Delta H^* < 0$, if the SE dominates the IE for the private jobs such that the private sector adjustment is increasing in b_1, there exist a private wage increase $_2(a)$ that completely compensates the partial equilibrium decrease in H^*. A similar derivation can be done for the dual bonus b_2, but given that it only affects the pubpriv share, we expect less of an impact on total labor supply and, therefore, less of a general equilibrium response.

A.5. A model of dual practice with a public threshold

In this section we present a stylized labor supply model of dual-practice as the one presented in the theory section but with a minimum public hour threshold. We assume a standard static labor supply model with Cobb-Douglas utility and two jobs, where doctors allocate time to their primary job and secondary job according to:

$$\begin{aligned}
&\max_{h_1,h_2,y} (\gamma_1 - h_1)^{\alpha_1} (\gamma_2 - h_2)^{\alpha_2} (y)^{1-\alpha_1-\alpha_2} \qquad (2)\\
&\text{s.t. } y = w_1 h_1 + \mathbf{1}\{h_2 > 0\}\pi_2(h_2, c) + I \\
&\qquad\qquad + \mathbf{1}\{h_2 = 0\}\mathbf{1}\{h_1 \geq \bar{h}\}b_1 + \mathbf{1}\{h_2 > 0\}\mathbf{1}\{h_1 \geq \bar{h}\}b_2, \\
&\quad 0 \leq h_j < \gamma_j \text{ for } j = 1, 2, \\
&\quad \alpha_1, \alpha_2 \geq 0 \text{ and} \\
&\quad h_1 + h_2 \leq T,
\end{aligned}$$

where h_j is the time allocated to job j (where $j = 1$ is public sector and $j = 2$ is private sector), which is bounded above by γ_j, α_j is the preference parameter for job j (so preferences can be different for each job), w_1 is the wage of the primary job (the public sector job), $\pi_2(h_2, c) \equiv w_2h_2 - c$ is the return of the private sector job which includes a fixed cost c, I is non-wage income and T is the total time available for leisure and consumption $T = \gamma_1 + \gamma_2$.[25] There are two potential bonuses that can be given to doctors in this setting: b_1 is the exclusivity bonus given to doctors if they only work in the public sector ($h_2 = 0$) and have a full public workload ($h_1 \geq \bar{h}$); b_2 is the bonus given to dual workers if they have a full public workload. The inclusion of two different bonuses in our model is motivated by our empirical setting to include two important cases.

- **Adding a public-only exclusivity bonus**: going from a setting in which there are no exclusivity incentives $b_1 = b_2 = 0$ to a setting with an incentive to be public-only ($b_1 = b > 0$, $b_2 = 0$).
- **Equalizing a public-only bonus for dual doctors**: going from a setting with an exclusivity bonus ($b_1 = b > 0, b_2 = 0$) to a setting in which the incentive to be public-only is removed by making the dual doctor bonus equal to the public only exclusivity bonus ($b_1 = b_2 = b > 0$).

We start by characterizing what happens given the full public workload cutoff $\bar{h}$, consider the case in which $h_2 = 0$. Maximizing the utility function in (1) gives the labor supply function

$$h_1^E = \gamma_1 \left(\frac{1 - \alpha_1 - \alpha_2}{1 - \alpha_2} \right) - \frac{\alpha_1}{1 - \alpha_2} \left(\frac{I}{w_1} \right) \tag{3}$$

if the bonus is not given ($b_1 = 0$). We have two cases, or types of doctors: (1) doctors that in absence of the bonus choose to work more than a full workload (i.e. $h_1^E \geq \bar{h}$) and (2) doctors that in absence of the bonus work less than a full workload (i.e. $h_1^E < \bar{h}$). The labor supply function will depend on the type of worker:

$$h_1^{E*} = \begin{cases} \max \left\{ h_1^E - \frac{\alpha_1}{1-\alpha_2} \left(\frac{b_1}{w_1} \right), \bar{h} \right\}, & \text{if } h_1^E \geq \bar{h} \\ \bar{h}, & \text{if } h_1^E < \bar{h}, b_1 \geq \bar{b}_1 \\ h_1^E, & \text{if } h_1^E < \bar{h}, b_1 < \bar{b}_1, \end{cases}$$

[25] We allow for the public and private sector caps γ_1 and γ_2 to be different as the public sector is more inflexible and has stricter contract hour guidelines.

where $\bar{b}_1 = \left(\frac{\gamma_1 - h_1^E}{\gamma_1 - \bar{h}}\right)^{\frac{\alpha_1}{1-\alpha_1-\alpha_2}} (w_1 h_1^E + I) - w_1 \bar{h} - I$ is the bonus amount that makes the doctor indifferent between h_1^E and $\bar{h}$. Note that for $h_1^E < \bar{h}$ the bonus has a discrete substitution effect. For convex indifference curves, for any $b > \bar{b}_1$ the doctor is better off choosing a higher indifference curve and setting $h_1 = \bar{h}$. Alternatively, if $b < \bar{b}_1$ then the bonus amount is not large enough to make the doctor want to increase its labor supply to $\bar{h}$. When the doctor's preferences are such that $h_1^E > \bar{h}$, then the bonus has an income effect; it reduces the labor supply by $\alpha_1 b_1 / w_1$ but not below $\bar{h}$. Overall, increasing the bonus predicts bunching at $\bar{h}$ with ambiguous effects on total labor supply depending on the share of doctors that would choose to work a full workload or not when $b_1 = 0$.

The inner solution when the doctors supplies positive labor to both jobs is defined by the following system of FOCs:

$$h_1^*(h_2) = \gamma_1 \left(\frac{1-\alpha_1-\alpha_2}{1-\alpha_2}\right) - \frac{\alpha_1}{1-\alpha_2}\left(\frac{I + w_2 h_2^* + \mathbf{1}\{h_1^* \geq \bar{h}\} b_2}{w_1}\right),$$
$$h_2^*(h_1) = \gamma_2 \left(\frac{1-\alpha_1-\alpha_2}{1-\alpha_1}\right) - \frac{\alpha_2}{1-\alpha_1}\left(\frac{I + w_1 h_1^* + \mathbf{1}\{h_1^* \geq \bar{h}\} b_2}{w_2}\right).$$

Solving for the inner solution labor supply functions when $b_2 = 0$, we have that

$$h_1^* = (1-\alpha_1)\gamma_1 - \alpha_1 \gamma_2 \left(\frac{w_2}{w_1}\right) - \alpha_1 \left(\frac{I-c}{w_1}\right),$$
$$h_2^* = (1-\alpha_2)\gamma_2 - \alpha_2 \gamma_2 \left(\frac{w_1}{w_2}\right) - \alpha_2 \left(\frac{I-c}{w_2}\right).$$

When $b_2 > 0$, as before, the optimal labor supply function will depend on the size of the bonus b_2.

$$h_1^{D*} = \begin{cases} \max\left\{h_1^* - \alpha_1 \left(\frac{b_2}{w_1}\right), \bar{h}\right\}, & \text{if } h_1^* \geq \bar{h} \\ \bar{h}, & \text{if } h_1^* < \bar{h}, b_2 \geq \bar{b}_2 \\ h_1^*, & \text{if } h_1^* < \bar{h}, b_2 < \bar{b}_2, \end{cases}$$

and

$$h_2^{*D} = \begin{cases} \max\left\{h_2^*(h_1) - \frac{\alpha_2}{1-\alpha_1}\left(\frac{b_2}{w_2}\right), \epsilon\right\}, & \text{if } h_1^* \geq \bar{h} \\ \max\left\{h_2^*(\bar{h}) - \frac{\alpha_2}{1-\alpha_1}\left(\frac{b_2}{w_2}\right), \epsilon\right\}, & \text{if } h_1^* < \bar{h}, b_2 \geq \bar{b} \\ h_2^*, & \text{if } h_1^* < \bar{h}, b_2 < \bar{b}_2, \end{cases}$$

where $\bar{b}_2 = \left(\frac{\gamma_1 - h_1^*}{\gamma_1 - \bar{h}}\right)^{\alpha_1/\delta} \left(\frac{\gamma_2 - h_2^*}{\gamma_2 - h_2^*(\bar{h})}\right)^{\alpha_2/\delta} (w_1 h_1^* + w_2 h_2^* + I) - w_1 \bar{h} - w_2 h_2^*(\bar{h}) - I$, $\delta = 1 - \alpha_1 - \alpha_2$ and a small $\epsilon > 0$ that ensures the solution is an inner solution.

Finally, we need to characterize when the doctors will decide to be dual job holders or public-only workers. Let $(h_1^{D*},\ h_2^{D*})$ be the inner solution optimal labor supply for dual job holders and $h_1^{E^*}$ be the optimal labor supply function for public only doctors. The utility function is monotonic in b_1 and b_2, therefore, there has to exist a set of bonuses such that $U(h_1^{D*},\ h_2^{D*}; b_1, b_2) = U(h_1^{E^*}, 0; b_1, b_2)$. In particular, we have that for a doctor to be exclusively public only it has to be that

$$\left(\frac{(\gamma_1 - h_1^{E*})^{\alpha_1}\gamma_2^{\alpha_2}}{(\gamma_1 - h_1^{D*})^{\alpha_1}(\gamma_2 - h_2^{D*})^{\alpha_2}}\right)^{1/\delta} \geq \frac{w_1 h_1^{D*} + w_2 h_2^{D*} + \mathbf{1}\{h_1^{D*} \geq \bar{h}\} b_2}{w_1 h_1^{E*} + \mathbf{1}\{h_1^{E*} \geq \bar{h}\} b_1},$$

where $\delta = 1 - \alpha_1 - \alpha_2$. This allows us to determine the level of each bonus that would make the doctor indifferent between being exclusive and holding a dual job. For $b_1 \geq \bar{b}_1$, conditional on b_2, we have that

$$b_1^* = \left(\frac{(\gamma_1 - h_1^{E*})^{\alpha_1}\gamma_2^{\alpha_2}}{(\gamma_1 - h_1^{D*})^{\alpha_1}(\gamma_2 - h_2^{D*})^{\alpha_2}}\right)^{-1/\delta} \left(w_1 h_1^{D*} + w_2 h_2^{D*} + \mathbf{1}\{h_1^{D*} \geq \bar{h}\} b_2\right) - w_1 h_1^{E*}.$$

makes the doctor indifferent between exclusivity and dual job holding. Increasing the bonus beyond b_1^* leads to exclusivity and reducing below b_1^* leads to dual job holding. Similarly, for $b_2 \geq \bar{b}$, conditional on b_1, we have that

$$b_2^* = \left(\frac{(\gamma_1 - h_1^{E*})^{\alpha_1}\gamma_2^{\alpha_2}}{(\gamma_1 - h_1^{D*})^{\alpha_1}(\gamma_2 - h_2^{D*})^{\alpha_2}}\right)^{1/\delta} \left(w_1 h_1^{E*} + \mathbf{1}\{h_1^{E*} \geq \bar{h}\} b_1\right) - w_1 h_1^{D*} + w_2 h_2^{D*}$$

makes the doctor indifferent, with increases in b_2 above b_2^* leading to dual practice and decreases below b_2^* leading to exclusivity.

To derive empirical predictions from the model suppose that we have a mass of doctors with different potentially different preferences over jobs (α_1, α_2) and characteristics X which may influence their wages $w_1(X), w_2(X)$. Denote the joint distribution over preference parameters and characteristics as F. Then, the share of public-only doctors in equilibrium is given by

$$s(b_1, b_2) = \int \mathbf{1}\{U(h_1^{D*}, h_2^{D*}; b_1, b_2) \leq U(h_1^{E^*}, 0; b_1, b_2)\} dF.$$

Result 1: (*Extensive margin*) The share of public only practitioners s is increasing in the exclusivity bonus b_1 and decreasing in the dual bonus b_2. Furthermore,

1. For any doctor that is a dual job holder, there exists a large enough exclusivity bonus, given by b_1^*, such that the doctor becomes public only.

2. For any doctor that is exclusively public, there exists a large enough dual bonus, given by b_2^*, such that the doctor becomes a dual worker.

Result 2: (*Intensive margin*) The effect of changing bonuses b_1 and b_2 will depend on the type of doctor. Increasing b_1:

1. Decreases h_1 for already exclusive doctors with more than a full public workload ($h_1 \geq \bar{h}$) towards $\bar{h}$. Income effect on full workload doctors.

2. Increases h_1 to $\bar{h}$ for exclusive doctors working less than a full public workload ($h_1 < \bar{h}$) that decide to jump to $\bar{h}$. Substitution effect for doctors working less than a full workload.

3. Increases h_1 for dual doctors that decide to become public only because of the exclusivity bonus increase. Substitution effect for switchers.

4. No effect on dual workers that do not switch.

Increasing b_2:

1. Decreases h_1 towards $\bar{h}$ and h_2 for dual workers that work a full public workload. Income effect on full workload doctors.

2. Increases h_1 to $\bar{h}$ for dual doctors working less than a full public workload ($h_1 < \bar{h}$) that decide to jump to $\bar{h}$. Substitution effect for dual doctors working less than a full workload.

3. Decreases h_2 for dual doctors working less than a full public workload ($h_1 < \bar{h}$) that decide to jump to $\bar{h}$, both because of a SE due to h_1 increasing and an IE due to the bonus increasing.

4. Increases h_2 and decreases h_1 for exclusive doctors that decide to become dual job holders because of the increase in b_2. Substitution effect for switchers.