Teachers' preferences for incentives to work in disadvantaged districts: A discrete choice experiment in Costa Rica

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Designing incentives to attract the best teachers to low-performing schools has become a fundamental objective in educational equity. We analyze the case of Costa Rica, where the most experienced teachers usually choose to work in the country's Central Region. We carried out a discrete choice experiment with a sample of 400 teachers in 52 schools, aiming to elicit their preferences to work at schools located in disadvantaged regions. The findings suggest that monetary incentives are the most effective to increase the probability of teachers accepting contracts in disadvantaged locations. In particular, economic bonuses show marginal effects between 8% and 22%. On the other hand, non-monetary incentives (working with highly qualified peers, direct access to supervisors of educational programs, and provision of material resources) are found to be important complements in the design of incentive packages. Combining monetary and non-monetary incentives, we obtain an acceptance rate to move to disadvantaged regions of more than 30% of the teachers. These incentive designs are especially relevant in the educational systems of developing countries, which face high internal inequalities and strong financial constraints.

Keywords**:** educational equity; teachers' recruitment and retention; teachers' incentives; discrete choice experiment, geographical imbalances

1. Introduction

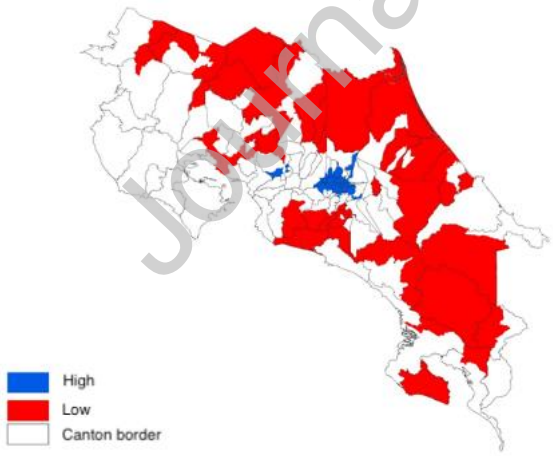
Schools that amass students with educational and socioeconomic disadvantages are not attractive workplaces. Thus, they face persistent difficulties recruiting and retaining teachers (Ajzenman, et al., 2021a). Education systems concerned with providing the same learning opportunities to all students have developed incentive programs to avoid imbalances in staff distribution, as well as attract the best teachers to schools in which many students who are at risk of social and economic exclusion can be found. These programs have relied, almost exclusively, on monetary incentives (De Ree et al., 2018; Cowan & Goldhaber, 2018). The large economic investments required for implementing the programs have had ambiguous results. The cost of the programs is high and teachers do not always respond to monetary incentives predictably (Pugatch & Schroeder, 2018; Swain et al., 2019; Wei & Zhou, 2019). Therefore, it is necessary to further examine incentive designs.

The objective of this article is to investigate the design of appropriate incentives within a developing country, Costa Rica, which faces the problems of the Global South in education. For example, it has a complex territory, in which many schools are located in zones with limited access to basic infrastructures (Gimenez, Martín-Oro & Sanaú, 2018). Besides that, it also has a deep polarization in the socioeconomic background of the students, which is reflected in their educational results (Gimenez & Castro, 2017). In this context, the incentive schemes need to be built to increase teachers' motivation to move to schools located in peripheral and poorly communicated areas, which are characterized by having deficits in infrastructure and services, and populations at risk of exclusion (Lentini, Gimenez & Valbuena, 2023). The Costa Rican incentive scheme has been criticized for its deficient design and effectiveness (Sánchez, 2016; DIUE, 2018). The distribution of teachers shows important differences between the peripheral and the

Central Region. In the Central Region, teachers have higher qualifications and experience, and students show lower dropout rates: 60% of young people complete secondary education compared to 48% in the peripheral regions (ENAHO, 2019). The Central Region also concentrates 62% of the country's population and the capital, San José, is the center of the national productive activities. In peripheral regions, where the population faces the greatest socioeconomic disadvantages, students have lower educational performance, teachers with temporary contracts are proportionally high, and the probability of teachers' accepting contracts is low (PEN, 2017; MEP 2019). See Figure 1.

Figure 1: Maps of Costa Rica by household's educational environment and concentration of interim teachers

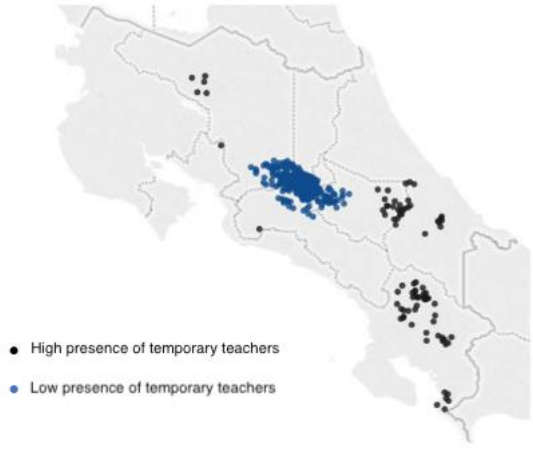
Cantons per household's educational attainment [a/]. Costa Rica, 2017



Source: PEN, 2017

[a/] The seven provinces that makeup Costa Rica are divided into 83 cantons, constituting a second-level subnational entity. The educational attainment is defined according to the average years of schooling of the household adults. Those with less than 6 years of education are classified as households with *low* educational attainment, between 6 and 12 years as *medium* (in white on the map), and when over 12 years as *high*.

Schools by concentration of interim teachers in the public education system [a/]. Costa Rica, 2017



Source: PEN, 2017

[a/] High and low presence of temporary teachers is defined using a spatial clustering of high or low values analysis.

Teachers prefer to work near where they grew up, while rural and more remote areas do not usually produce university or teacher college graduates who would like to remain there (Boyd et al. 2005; Reininger, 2012). Therefore, enhancing highly qualified and experienced teacher mobility from the Central Region to the peripheral regions poses the challenge of designing an efficient incentive system (Saas et al. 2012). To contribute to this purpose, we conduct this research based on the Discrete Choice Experiment methodology (henceforth DCE). We surveyed a randomly selected sample of 400 teachers serving in 52 schools (out of the existing 180 in the Central Region).[1] The sample was representative of secondary school teachers in the Central Region. The method allowed the identification of preferences that maximize the utility of teachers who chose between alternative hypothetical job scenarios, considering respondents' preference heterogeneity. DCEs have previously been used in health economics to study incentives to move health staff to unattractive areas (Kolstad, 2011).

As far as we know, only Burke & Buchanan (2022) had previously applied a DCE to study teachers' incentives to move to rural areas, specifically to difficult-to-staff remote schools in the state of New South Wales (NSW), Australia. However, these authors do not consider using the results to simulate incentive packages to explore combinations, which is a major gap.

Our research makes the following unique contributions to the literature. It is the first study analyzing teachers' incentives to move to disadvantaged areas by applying the

[1] The sample selection followed a multi-stage clustering sampling strategy and started by stratifying the sample in regions (7 regions). The selection of the schools was done by systematic jump with random start, and with proportional allocation according to the number of teachers per school in order to allow teachers to have the same probability to be selected. Once in the school, teachers were randomly selected from the list provided by the director of the school on the day of the visit. A maximum of 8 teachers per school (2 teachers maximum per subject) to avoid observations clustering. The reason to select the school (as the cluster) rather than directly the teacher was that lists of teachers were not available until going to the selected school.

DCE technique to a country in the Global South. Additionally, it is the first study that interviews in-service teachers and focuses on the reality of a whole country, with a centralized educational policy, instead of analyzing a particular region within a country. Finally, we simulate take-up rates of potential packages combining monetary and non-monetary incentives, a crucial contribution for countries facing budgetary constraints.

The paper has been structured in six sections. Following this introduction, section 2 presents the theoretical framework and background in the literature. Section 3 explains the methodology. Section 4 presents the results. Section 5 discusses the findings and links them to other work. Section 6 presents the main conclusions of the study.

2. Theoretical framework and literature review

The DCE method, with which individuals declare their preferences between two or more hypothetical, plausible, and viable options, has been widely used in the areas of health, (De Bekker-Grob et al., 2012), transportation (Higgins et al., 2017), and environmental studies (Toledo-Gallegos et al., 2022). More recently, this methodology has also been used in economic research. In particular, associated with studies of workers' behavior in the labor market, DCE has allowed eliciting their preferences about alternatives for which there is no market information (Mas & Pallais, 2017; Demel et al., 2019). The DCE has the advantage of allowing the isolation of workers' preferences from other considerations (such as the preferences of the employer or the market conditions), which would not be possible by solely analyzing market information. Additionally, authors such as Mas & Pallais (2017) and Wiswall & Zafar (2018) have demonstrated that preferences for jobs revealed in the DCE closely correspond to choices in the real world.

Until now, DCE studies on work incentives have been carried out mostly in the field of health economics. The incentives found in the literature for attracting health staff

to disadvantaged locations can be classified into three categories. The first category includes the basic conditions of a contract. That is, the remuneration (economic bonuses as a percentage of the salary or a fixed amount), work time, vacations, contract period, and possibilities of career advancement, among others (Liu et al., 2019). The second is associated with the overcoming of barriers that mobility entails. These incentives may include goods or services that might be considered as monetary since the workers do not have to spend their income to pay for them, such as the provision of housing and transportation; and non-monetary options, such as the provision of supporting materials (Efendi et al., 2016). Finally, the third category of incentives includes motivational elements of a psychological nature, such as training or teamwork (Günther et al., 2010).

The incentives identified in health economics literature are a good starting point for the design of teacher incentives. As far as we know, only Burke & Buchanan (2022) had previously carried out a DCE to explore preferences for contracts in the educational area with in-service teachers. The results revealed that the two most attractive kinds of incentives were those of financial support (mainly those at the beginning of their careers) and securing a permanent contract in the system and transfer to a teacher's choice placement in 2-4 years after. Therefore, the authors conclude that the preferred incentives might create two challenges, the over-increase of the most popular locations demanded through the transfer requests and that the rural/remote schools would be likely to be staffed by the most inexperienced personnel creating a new potential disadvantage.

Budgetary pressures in the educational systems associated with incentives for attracting teachers to disadvantaged schools are due to the fact that these incentives have been designed based, almost exclusively, on monetary stimuli. Indeed, the evidence indicates that wages can make positions in rural or remote areas more attractive, as well as reduce teacher turnover in hard-to-staff, disadvantaged, and low-performing schools in districts from the United States (Imazeki, 2005; Hendricks, 2014; Swain et al., 2019).

However, the design of monetary incentives for teachers is complex and can lead to uncertain results and consequences. For example, Clotfelter et al. (2011) examined the potential of using differentiated salaries to promote teacher retention in schools that concentrated minority and low-income students in North Carolina, United States. Their results showed that teachers with higher qualifications responded less to the economic incentives, and retention was concentrated in low-qualified teachers.

Different school systems have designed incentives to attract and retain teachers that have included a variety of financial bonus options: as a percentage of the monthly salary (bonus up to 40% of the teachers' base salary) (Clotfelter et al., 2011; Elacqua et al., 2022), a one-time bonus when accepting the contract (Protik et al., 2015) or a fixed annual bonus (Cowan & Goldhaber, 2018; Castro & Esposito, 2022).

Adding to the complexity of incentives design there is the fact that data on programs' performance is very limited, particularly in developing countries. In the specific case of Costa Rica, the existing scarce literature mainly describes the current monetary incentives aimed at attracting and retaining teachers in schools located in low social-developed districts (PEN, 2015; Sánchez, 2016; DIUE, 2018).

Non-monetary factors related to working conditions have also been shown to affect teacher preferences (Falch & Strom, 2005; Bradley, Green & Leeves, 2006; Henry et al., 2010). Examples of these factors are student sociodemographic characteristics, school conditions (such as the availability of up-to-date materials and equipment, the qualification of teaching colleagues, and the leadership of the directors, among others), and location characteristics. Despite the identification of the effect of non-monetary factors in the decisions of teachers, to the best of our knowledge, these factors have not been taken into account for the design of incentives in a DCE framework. Recent studies, such as the one by Tran & Smith (2020), that analyze non-monetary factors affecting the recruitment of teachers to unattractive districts, indicate the need to carry out DCE

analyses to determine their relative importance. In this article, we overcome this gap in the literature by using DCE to assess the importance of non-monetary incentives compared to monetary ones. As an additional contribution, we interviewed in-service teachers and estimated their probability of accepting alternative contracts.

3. DCE design and model

Procedure: Incentives and DCE design

In general, each incentive in the DCEs is offered at different levels. If the description of the process to define the incentives and levels is imprecise, it may weaken the potential to exploit the results (Lancsar & Louviere, 2008). To confront this limitation, the approach to selecting attributes for DCEs and levels has increasingly used qualitative methods (Soekhai et al., 2019). We designed the qualitative process in four steps, shown in Table 1. Following the recommendations of Coast et al. (2012), we interviewed teachers and key respondents to make sure that the incentives were relevant for teachers and, at the same time, useful to policymakers. The results obtained in each phase fed the next one; and this allowed us to make an exhaustive exploration, avoiding the omission of important incentives, and sharpening those selected.

Table 1: Qualitative incentives and level design

Part	Step		Participants	Objective
I	1	Literature review		Identify attributes in the literature for staff mobility.
	2	In-depth interviews	Key respondents [a/] and target teachers	a) Identify incentives, b) Validate incentives gathered from the literature review and the interviews, c) Sort attributes by relevance (according to the teachers), and viability (according to the key respondents)
II	3	Focus groups	Key respondents	Confirm the feasibility of the attributes and levels selected for the instrument.
	4	Pilot face-to-face interviews with debrief	Target teachers	Assess the attributes and levels of the instrument and the duration of the experiment.

Source: Own elaboration. a/Policymakers, technical human resources staff in the Ministry of Education, and union representatives.

The in-depth interviews of part I were carried out following a semi-structured interview guide based on Rao et al. (2010). The interviews allowed us to achieve a long list of potential attributes. Table 2 describes the 6 incentives that we selected. [2]

Table 2: Incentives and levels selected for the DCE. [a/]

Type	Incentives	Level options and description	Nature
Basic conditions	Bonus: additional income as a percentage of the monthly baseline salary for the moving period (2-5 years).	20% (baseline)[b/] 30% 40% 50%[c/]	**Monetary**
	Increased score assigned to the teaching category[d/]	None (baseline) 3 points per year for tenure teachers, or 1.5 per year for interims	
Overcoming barriers	Borrowed housing	Housing to be paid by the teacher (baseline) Housing borrowed from the Ministry of Education for the family near the school (2 bedrooms, 1 bathroom and a kitchen) [e/]	
	Transportation	Transportation to be paid by the teacher (baseline) Free bus or gasoline for own vehicle (mileage), to travel to the Central Region, round trip once a fortnight	
	Technological resources and pedagogical materials	Nothing additional, what the school has (baseline) Supply of teaching materials, computers and additional technological equipment[f/]	**Non-monetary**
Motivating factors	Working with highly qualified peers and pedagogical support	Nothing special. Current peers in the school and no pedagogical support (baseline) Presence of at least two other teaching colleagues from the same highly qualified moving program in the school, and pedagogical support from supervisors of Ministry of Education	

[2] The online supplementary material (accessible through the link https://docs.google.com/document/d/1lpRnLuSi5M3E2PwW6wZRc-bYcuclDuB9/edit?usp=sharing&ouid=101667428588935752396&rtpof=true&sd=true) contains all the documents and information on the DCE design, including the attributes selection criteria to define its priority and feasibility according to teachers, policymakers (ministers) and union representatives (Procedures S.1). The supplementary material details the sampling strategy and the procedure we used to contact schools and teachers, the conditions under which the interviews were conducted, the measures we took to ensure the confidentiality of the responses, the questionnaires and the study stakeholders who contributed to the interviewee's reliance (Procedures S.2). Databases and do-files coding can be provided by the authors upon request.

[a/]The attributes have been translated from Spanish [b/]The baseline is the reference level, the base comparator and *status quo*. [c/]The 50% incentive over the teacher's monthly base salary was considered feasible and reliable for teachers, policymakers and union representatives consulted during the qualitative study, because this percentage is currently offered to teachers who work under a special scheme in schools (called "telesecundarias") located in remote rural districts. The current provided bonus is 20%. [d/]A higher score allows to improve the salary and the position in recruitment competitions. [e/]The housing would be offered for the duration of the contract. [f/]Other infrastructure conditions were not considered as relevant in the qualitative study (only ventilation in the buildings was repeatedly mentioned, however electricity and water concerns usually mentioned in the literature – Kolstad, 2011— are not scarce in rural Costa Rica).

Before defining the final DCE survey questionnaire, we designed a pilot version to be tested with teachers. This process allowed us to refine the description of the incentives and their levels in the contract scenarios.

We created the DCE scenarios using the Sawtooth Choice-Based Conjoint software (Sawtooth Software Inc. 2007) with its Efficient design option, with the task generation method through Balanced overlap, and with orthogonality for fixed design. With orthogonality, the attribute levels are chosen independently of other attribute levels. In the fixed design, respondents were divided randomly into groups, with different groups receiving different questionnaire versions (Sawtooth, 2017). The Balanced overlap ensured that each incentive level of an attribute was shown approximately an equal number of times and, therefore, the variance of the parameter estimates was minimal, and within the choice sets, attribute levels overlapped as little as possible; hence, incentives were not allowed to be all in the same level within a set. We used a fractional factorial design because a full factorial would have produced too many scenarios to be evaluated by teachers.[3] With the fractional design, we generated two versions of 12 scenarios, for a total of 24 scenarios (48 contract options were evaluated in total). The combination of six incentives for each contract option was unique and the order in which we presented the scenarios to the teachers was random. Each teacher evaluated 12 scenarios with two possible contracts to choose from.

[3] A full factorial would have generated $4^1*2^5=128$ possible contract alternatives, and (128*128-128)/2=8128 scenarios with 2 contract alternatives to select from.

Data collection

The survey was administered paper-and-pencil, conducting face-to-face interviews in the schools, with prior authorization from the school management.[4] Before asking the DCE questions, we ensured teachers understood the context in which the contract options were offered explaining that they were asked to work in schools remote from the Central Region, which are often rejected. In order to illustrate the situation, we mentioned four districts.[5] Then, we asked the teachers to assume that there was an educational support program for those moving to serve these districts schools for two to five years, a period after which they could return to their current position.[6]

We designed the experiment so that each teacher stated their preferences in two steps per scenario. [7] As a first step, they had to choose between two possible contracts, which in the literature is called "forced options" (Vedlwijk et al., 2014). Immediately

[4] Contact with the administration of the schools was carried out by telephone assuring the confidentiality of the data collection and usage. The attrition rate of schools in the study was 8%, i.e. 92% of selected schools participated, and 100% of the teachers selected in the school answered the survey. The average duration of each interview was 25 minutes. The fieldwork to collect the data was carried out from February 18 to March 30, 2019, eight experienced pollsters and four supervisors, in 4 fieldwork teams visiting one school per day.

[5] The four districts outside of the Central Region, that we selected to exemplify it, had high rates of rejection of teaching contracts in 2018: Los Chiles, Siquirres, Sarapiquí, and Central Puntarenas (above 5% of the contracts rejected) (MEP, 2018). We decided to identify the districts to ensure that all teachers responded under the same premise and avoid omitted variable bias affecting our results. The situation was framed as follows: "With information from the Human Resources Department of the Ministry of Public Education, it has been possible to identify regions in which teachers who compete for positions prefer not to apply, or if they are offered a position, they reject it. These are districts far from the Central Region in cantons such as Los Chiles, Siquirres, Sarapiquí, and Central de Puntarenas. Imagine that the Ministry of Public Education is carrying out an educational strengthening program for schools in districts of those cantons, temporarily sending teachers who have demonstrated leadership to make a difference for students. We present two temporary contract alternatives to attract teachers like you to schools in those districts. You will see that each contract has its advantages and disadvantages, and therefore you will have to read carefully the information about them to choose the contract you prefer." Please, see the questionnaire in the supplementary material.

[6] The proposed length of the contract takes into account the minimum of 2 years required by law, so that the Ministry authorizes the teacher to transfer to another school (Art.58 of the Teaching Career Regulation, 4565 - 1970) and a maximum of 5 years considering the duration of the academic cycle of secondary education.

[7] In the first step per scenario of two contracts, we asked: "Between these two contract options, which of the two would you prefer?" Immediately after, as a second step we asked: "In your current situation, would you accept that contract that you chose, or would you prefer to stay in your current position?"

after choosing between the two contracts, the teacher had to decide between sticking to the contract forcibly selected or to "opt-out". To opt-out meant to stay in their current position/school because the selected contract in step one was not attractive enough to eventually move outside the Central Region (see an example in Figure S1.1 of the supplementary material). This two steps approach increases realism and avoids the problem of respondents being forced to choose options they may not prefer, while improving the statistical efficiency of the design (Lancsar et al., 2017; OECD, 2018). Additionally, the rationale of the approach is to mitigate the status quo cognitive bias (the tendency of the individual to remain in the current situation) if they are offered a direct opt-out option (Oehlmann et al. 2017). Vedlwijk et al. (2014) analyze forced and unforced choice models and conclude that higher data quality might result from a dual response design compared to offering a direct opt-out option. They provide evidence that starting with the forced model within each choice task, respondents have to seriously weigh the different levels of attributes before being asked if they would like to opt out. The study of Vujicic et al. (2010) shows the advantages of this two-step perspective in a case study in the health sector.[8]

During the survey, we also collected teachers' demographic information to analyze potential heterogeneous effects of incentives by subgroup. The teachers' response rate was 100%. The sample, statistically representative of all the teachers of basic subjects in the Central Region of Costa Rica, allows making population inferences with a margin of error of around 4.68 percentage points at the 95% confidence level. [9]

[8] In the first step, we forced the interviewees to evaluate and identify what they would consider the best optional contracts (combination of incentives) to attract teachers to move. In the second step, they had to decide which contract they would choose for themselves, including opting out (not choosing to move and keeping their current job contract).

[9] This error margin pertains to proportion estimation within the context of a simple random sampling assuming infinite variance.

Model and descriptive statistics

We use the concept of utility maximization in our model following McFadden (1974). We assume that teacher *n* is rational and that, when choosing between contracts, she/he opts for the one that maximizes her/his utility (benefit or satisfaction). [10] Therefore, she/he selects contract *i* over contract *j*, if and only if, $U_{ni} > U_{nj}$. The utility *U* of teacher *n* who chooses contract *i* is not directly observable and is given by:

$$U_{ni} = V_{ni} + \varepsilon_{ni} \quad (1)$$

The deterministic component V_{ni} is a function of the attributes of contract *i* that are observable (for example, *bonus*). The idiosyncratic error term ε_{ni} is independent and identically distributed (IID), and a function of unobservable contract attributes and variations in individual preferences. The utility of teacher *n* in selecting contract *i* over contract *j* considering attributes and levels is given by:

$$U_{ni} = \alpha_1 + \beta_1 Bonus(30\%)_{ni} + \beta_2 Bonus(40\%)_{ni} + \beta_3 Bonus(50\%)_{ni} + \beta_4 Score\ assigned\ to\ teaching\ category_{ni} + \beta_5 Borrowed\ housing_{ni} + \beta_6 Transportation_{ni} + \beta_7 Technology\ and\ materials_{ni} + \beta_8 Peers\ and\ support_{ni} + \varepsilon_{ni} \quad (2)$$

The dependent variable is the option selected by the individual among the contract choices offered in each scenario. This dichotomous variable takes the value of 1 for the chosen contract and 0 otherwise. All attributes and their levels are coded as dummy

[10] While this assumption is central to the structure of a DCE, we acknowledge that the literature has often found inconsistencies in the decisions that individuals make in the utility maximization in the DCE context, which could lead to unsound welfare estimates (for a detailed explanation, see Espinosa-Goded et al., 2021).

variables, and preferences are modelled relative to their baseline (coded as 0). The probability of choosing contract *i* over *j* can be calculated using the logit function (3):

$$P_{ni} = Pr\left[U_{ni} > U_{nj}\right] = Pr\left[V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj}\right] = Pr\left[\varepsilon_{nj} < \varepsilon_{ni} + V_{ni} - V_{nj}\right] \quad (3)$$

With the estimated probability for each contract, we measured the marginal contribution in the teachers' preference for each attribute level and the take-up rate given by: $Pn_i - Pn_k$. Where Pn_k is the contract with the attributes in the baseline and Pn_i is the contract with a higher level on one of the attributes (Ryan et al., 2012). Specifically, we estimated a mixed logit model (MXL), which allows considering unobserved heterogeneity in the preferences of individuals and overcoming the independence of irrelevant alternatives (IIA) assumption. Thus, we could attain multiple observations per individual in the estimation of the parameters and enable them to vary according to their statistical distribution (Train, 2009). [11]

Furthermore, we carried out separate analyses by sex, and age, which are some of the most common categories when performing subgroup analysis in the case of teachers (Ryan et al, 2012), in order to understand preferences based on different characteristics of the respondents.

[11] An alternative-specific constant (ASC, the constant term of our estimates) was included within each choice set. The ASC for each alternative contract "captures the average effect on the utility of all factors that are not included in the model" (Train, 2009, pp.20). The difference between the ASC for the forced and the unforced models is that, in the forced model, it captures the average effect on the utility of factors related to the other alternative contract scenarios; for the unforced model, it captures not only the average effect on the utility of factors related to the other alternative contract scenarios but also the teacher's current contract (job) characteristics he/she is willing to leave if moving.

In the following section, we present the results for the entire sample of 400 teachers and 9,600 observations (400 x 24 forced scenarios)[12] and the results associated with the subsample of teachers who were willing to move with at least one of the contract offers: 209 respondents and 7,524 observations (209 x 24 scenarios + 209 x 12 opt-out options), representing 52.3% of the total sample (191 teachers opt-out all scenarios). This percentage provides the first result of the experiment: more than half of the teachers considered that some of the proposed incentives (or combination of incentives) were attractive enough to accept a contract outside the Central Region.

Table 3 offers the descriptive statistics of the total sample (column 1) and that of the subsample of teachers willing to move (column 2) or not (column 3). [13] The population of teachers in schools in the Central Region is mainly female (64%), the average age is 41 years, 88% were born in the Central Region and 59% reach the highest teaching category. When comparing teachers' observable characteristics of the subsample of teachers who are willing to move with the subsample of who would not accept to move under any contract option they maintain the same structure, except for the sex variable, for which men are overrepresented in the willing to move subsample. When analyzing women and men characteristics through Chi-Square tests, the willingness to accept is related to having kids (Pr = 0.014) but not to having a partner (Pr = 0.848). Women with kids are significantly more willing to accept than men.

Table 3: Descriptive statistics of teachers' characteristics. Means.

	Total sample[a/] (1)	Subsample of willing to move teachers[b/] (2)	Subsample of not willing to move teachers (3)
Sex (%)[c/]			
Male	36.3	41.1	30.9

[12]The opt-out option in the full sample was used to screen teachers unwilling to move under any of the contract offered.

[13] Comparison of the two-subsample was made using z-test for proportions and the t-test for mean (age), with 95% confidence.

Female	63.8	58.9	69.1
Mean age (standard deviation)	41.2 (8.4)	40.1 (8.6)	42.4 (8.3)
Province of birth (%)			
San Jose (capital)	43.8	41.6	40.1
Province in the Central Region	44.0	43.1	45.0
Coastal province	12.3	15.3	8.9
Total	100.0	100.0	100.0
Observations	400	209	191

Notes: [a/]Includes all teachers forced preferences. The structure of this sample follows the structure of the population of teachers in the Central Region. [b]/Only includes teachers who would accept to move under at least one of the proposed contracts. [c/] In the universe of 4,511 teachers, 62.4% are women, and the age mean of the is 41.7.

Finally, the subsample of willing-to-move respondents allowed us to calculate two measures of great interest in DCE studies. First, we calculated the *take-up rate*, which gives us the changes in the probability of acceptance of contracts in order to work outside the Central Region for each incentive or combination of incentives compared to the baseline. Second, we quantified the "willingness to pay" (WTP), that is the salary that teachers would be willing to sacrifice to benefit from the improvement in certain attributes, taking the baseline salary as the monetary base. The WTP is calculated as in Ryan et al. (2012):

$$WTP(x_m) = \frac{\frac{\partial U}{\partial x_m}}{\frac{\partial U}{\partial salario_{ni}}} = -\frac{\beta_x}{\alpha_2} \quad (4)$$

4. Results

Table 4a shows the results of the MXL model estimates. Columns 1 and 2 show the coefficients of the attributes. All were positive and significant. Consequently, increases in the level of each incentive increased the utility for the teachers and made the contracts more attractive.

Table 4a: MXL model coefficients of the preference for incentives to move outside the Central Region of Costa Rica, 2019.

Incentives	*Parameters means*		*Parameters standard deviations*	
	Total sample[a/] (1)	Subsample of willing to move teachers[b/] (2)	Total sample[a/] (3)	Subsample of willing to move teachers[b/] (4)
Constant[c/]	0.023 (0.066)	0.204 (0.137)		
Bonus 30% (Base: current bonus)	0.681*** (0.102)	1.168*** (0.207)	0.495** (0.183)	0.990** (0.358)
Bonus 40% (Base: current bonus)	1.696*** (0.111)	2.692*** (0.217)	0.663*** (0.132)	0.668** (0.253)
Bonus 50% (Base: current bonus)	2.368*** (0.143)	3.732*** (0.292)	0.953*** (0.127)	1.435*** (0.267)
Score assigned to teaching category (Base: no score)	1.763*** (0.124)	2.440*** (0.244)	1.463*** (0.115)	1.900*** (0.237)
Housing (Base: no housing borrowed by the system)	1.163*** (0.098)	1.940*** (0.208)	1.300*** (0.100)	1.788*** (0.207)
Transportation (Base: no transportation provided by the system)	0.504*** (0.062)	0.875*** (0.136)	0.527*** (0.094)	0.733*** (0.179)
Technology and materials (Base: no additional technological and material resources)	0.539*** (0.065)	0.635*** (0.134	0.496*** (0.112)	0.566*

		)		(0.282)
Working with highly qualified peers and support (Base: current peers in the school and no pedagogical support)	0.455*** (0.055)	0.730*** (0.120)	0.413*** (0.100)	0.853*** (0.155)
Number of observations	9 600	7 490		
Number of teachers	400	209		
Log likelihood	-2 450.192	-929.871		
Likelihood ratio chi2 (8)	375.460	222.140		
Prob > chi2	<0.001	<0.001		

Notes: We ran 500 Halton draws for each prediction to ensure a robust result. Standard errors in parenthesis. All coefficients have statistically significant standard deviations at 5%. This suggests that there is preference heterogeneity over the attributes * p<0.1; ** p<0.05; *** p<0.01. [a/]Includes all teachers forced preferences [b]/Only includes teachers who would accept to move under some of the proposed contracts and would not opt-out (stay in their current school). [c/]Alternative-specific constant.

Table 4b shows the marginal effects: the effect that each incentive has on the change in the probability of teachers preferring a contract keeping the rest of the incentives at their baseline values. The comparison of the results between the entire sample of teachers and the subsample of teachers who are willing to move does not show differences in the priorities regarding the six incentives offered.[14]

Table 4b: MXL marginal effects of the preference for incentives to move outside the Central Region of Costa Rica, 2019.

Incentives	Total sample[a/] (1)	Subsample of willing to move teachers[b/] (2)
Bonus 30% (Base: current bonus)	0.082***	0.102***
	(0.025)	(0.042)
Bonus 40% (Base: current bonus)	0.196***	0.224***

[14] The fact the subset of teachers willing to move do not differ in their preferences and observable characteristics with respect to the entire sample of teachers gives us confidence that we do not have sample selection, thus, results being representative of the universe of teachers.

	(0.065)	(0.097)
Bonus 50% (Base: current bonus)	0.196***	0.194***
	(0.111)	(0.143)
	0.073***	0.051***
Score assigned to teaching category (Base: no score)		
	(0.065)	(0.069)
	0.035***	0.027***
Housing (Base: no housing borrowed by the system)		
	(0.039)	(0.044)
	0.010***	0.005***
Transportation (Base: no transportation provided by the system)		
	(0.010)	(0.007)
	0.025***	0.014***
Technology and materials (Base: no additional technological and material resources)		
	(0.020)	(0.017)
	0.025***	0.021***
Working with highly qualified peers and support (Base: current peers in the school and no pedagogical support)		
	(0.019)	(0.023)
Number of observations	9 600	7 490
Number of teachers	400	209
Log likelihood	-2 450.192	-929.871
Likelihood ratio chi2 (8)	375.460	222.140
Prob > chi2	<0.001	<0.001

Notes: We calculated the marginal effects using the Stata mixlpred command. Standard deviations in parenthesis. * p<0.1; ** p<0.05; *** p<0.01. [a/]Includes all teachers forced preferences [b]/Only includes teachers who would accept to move under some of the proposed contracts and would not opt-out (stay in their current school).

The results allowed us to identify that the incentives with the highest marginal effects were associated to the monetary preferences: *bonuses, score assigned to teaching category* and *borrowed housing*; with marginal effects between 8% and 22% in the bonuses; between 5% and 7% in the teaching category; and between 3% and 4% in housing. The group of non-monetary incentives (*peers - pedagogical support, technology, and material resources*) had minor marginal effects (between 1% and 3%).

In categorical variables, the interpretation of the estimated parameter is the marginal value of a movement from the base level to the alternative level. For example, in the group of teachers willing to move, adding a *score for teaching category* increases the probability of taking the remote job by 5% in contrast to not providing any score.

Subgroups analysis

In the DCE literature, it is common to split the sample for subgroup analysis, generally by sex and age groups (Ryan et al, 2012). The analysis by sex is of special interest in our case since, in the Latin American context, about 75% of teachers are women of relatively low socioeconomic backgrounds (Bruns & Luque, 2014). They have traditionally sought specific incentives in the profession, such as greater ease in reconciling family life or enjoying more job stability, equal income, and more equitable treatment with respect to their male peers than women working in other sectors. Age was segmented as a proxy for experience. Teachers who are beginning their professional careers and have less experience are those who tend to work with students from vulnerable socioeconomic backgrounds and low educational performance, as well as in rural and remote areas (Berlinski & Ramos, 2018; Burke & Buchanan, 2022).

Table 5 shows that there were significant gender differences in specific attributes. Women were more responsive to the *30%* and *40%* bonus than men, but there were no statistical differences between men and women in the preferences for 50% bonuses.[15] Additionally, women showed a significantly higher preference than men for the *score assigned to teaching category* and for *transportation* incentives. In other words, their preferences for monetary incentives were relatively higher. The analysis by age

[15] Differences were calculated using: $\frac{(\beta_f - \beta_m)}{\sqrt{se_f^2 + se_m^2}}$ with z=1.96, 95% confidence.

subgroups did not show differences statistically significant between younger and older teachers in the election of the attributes.

Table 5: MXL model coefficients of the preference for teaching incentives for moving outside the Central Region of Costa Rica by sex and age.

Incentives	Sex		Age	
	Female (1)	Male (2)	18 to 40 (3)	41 to 65 (4)
Constant[a/]	0.128	-0.111	-0.070	0.125
Bonus 30% (Base: current bonus)	0.814***§ (0.717)	0.485***§ (0.117)	0.781*** (0.463)	0.569*** (0.563)
Bonus 40% (Base: current bonus)	1.829***§ (0.774)	1.498***§ (0.506)	1.771*** (0.621)	1.618*** (0.766)
Bonus 50% (Base: current bonus)	2.477*** (0.673)	2.224*** (1.249)	2.346*** (0.680)	2.352*** (1.218)
Score assigned to teaching category (Base: no score)	2.077***§ (1.552)	1.305***§ (1.235)	1.909*** (1.445)	1.645*** (1.475)
Housing (Base: no housing borrowed by the system)	1.193*** (1.406)	1.133*** (1.189)	1.179*** (1.337)	1.119*** (1.185)
Transportation (Base: no transportation provided by the system)	0.616***§ (0.500)	0.366***§ (0.586)	0.546*** (0.489)	0.488*** (0.591)
Technology and materials (Base: no additional technology and material resources)	0.582*** (0.440)	0.492*** (0.480)	0.509*** (0.425)	0.619*** (0.56

				5)
Working with highly qualified peers and support (Base: no peers and pedagogical support)	0.480*** (0.463)	0.412*** (0.327)	0.460*** (0.487)	0.443*** (0.305)
Number of observations	6120	3480	5016	4584
Number of teachers	255	145	209	191
Log likelihood	-1512.79	-917.86	-1267.29	-1176.86
Likelihood ratio chi2 (8)	245.50	133.39	187.60	194.33
Prob > chi2	0.000	0.000	0.000	0.000

Notes: Standard deviations in parentheses. * p <0.1; ** p <0.05; *** p <0.01. The regression is run for each subgroup. The base level is the same for all subgroups. Statistical differences between pairs of subgroups are indicated with §. [a/]Alternative-specific constant.

Package of incentives simulations for teacher recruitment

Two key estimates for policymakers are calculations of (*take-up rate*), that is, if the incentives really allowed them to attract teachers; and the WTP, the maximum level of salary that teachers were willing to stop receiving to achieve better conditions in other aspects (incentives).

Table 6 presents the results of the *take-up rate* per incentive and combinations of incentives (packages). The take-up rate expresses the changes in the probability of accepting a given contract to move outside the Central Region of Costa Rica as levels of incentives are changed, compared to the baseline contract for the subsample of teachers willing to move. It also presents the average proportion of teachers expected to move in the total sample (last two rows).

In column 1, we see how a bonus with an additional income of *30*% over the baseline bonus, all other attributes remaining equal, would change the probability of attracting teachers in 25% of those willing to move. That is, it would have a relatively small impact. The take-up rate with the maximum bonus (*50*% above the baseline salary

all other attributes remaining equal) would reach up to 82% of those willing to move (column 3). Another possibility of reaching a similar take-up rate and level of recruitment would be by offering a combination of incentives. For example, for the package in column 12 (containing *peer and pedagogical support*, *technological and material resources*, and *borrowed housing*), the take-up rate would reach 86% above the baseline in the willing to move sample. Furthermore, the exclusive combination of non-monetary incentives in column 14 (*peers and pedagogical support* and *technological and material resources*) would achieve a higher take-up rate than only offering a *30*% bonus (52% vs 25% in the willing to move sample, respectively). The largest teachers' *take-up rate* (100% in the willing to move sample) would be achieved by offering all incentives at their highest point, as observed in column 15, and therefore an estimated average of 52% of teachers in the total sample from the Central Region. However, offering all incentives would impose strong pressure on educational funds. Thus, take-up rates estimates and simulations can provide decision makers measures of alternative policy actions according to the number of teachers they need to move and to their budgetary restrictions.

Table 6: Take up rate simulation. Changes in the probability of accepting a given contract to move outside the Central Region of Costa Rica as levels of incentives are changed, compared to the baseline contract. Scenarios offering singular incentives and packages of incentives in the subsample willing to move.

Scenarios	*Singular bonus incentives*			*Singular non-monetary incentives*					*Packages combining 1 bonus + 2 non-monetary incentives*			*Packages combining only non-monetary incentives*			*Package providing all*
Attributes	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Bonus	*30%*	*40%*	*50%*	*No*	*No*	*No*	*No*	*No*	*30%*	*40%*	*50%*	*No*	*No*	*No*	*50%*
Score assigned to the teaching category	*No*	*No*	*No*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*Yes*	*No*	*Yes*
Borrowed housing	*No*	*No*	*No*	*No*	*No*	*Yes*	*No*	*No*	*No*	*No*	*No*	*Yes*	*No*	*No*	*Yes*
Transportation	*No*	*No*	*No*	*No*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*Yes*
Technology and material resources	*No*	*No*	*No*	*No*	*No*	*No*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Working with highly qualified peers and pedagogical support	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Take up rate in the subsample[a/]	0.250	0.674	0.822	0.748	0.314	0.626	0.271	0.287	0.680	0.884	0.9399	0.864	0.912	0.518	0.999
Standard error	(0.127)	(0.117)	(0.101)	(0.052)	(0.054)	(0.056)	(0.057)	(0.049)	(0.084)	(0.052)	(0.0384)	(0.036)	(0.029)	(0.064)	(0.001)

Note: The calculation is done with the Stata nlcom command. [a/] All significant at 0.01, except for scenario 1, at 0.05.

Finally, Table 7 presents the results of the WTP calculation (the maximum salary level that teachers would be willing to sacrifice to achieve better conditions in other aspects, incentives). The average baseline salary for teachers in the sample was US$ 1,659 per month. On average, teachers willing to move agreed to sacrifice US$ 281 of their salary to increase the *score assigned to teaching category*. Additionally, the willingness to forgone wages to have a *borrowed housing* for their family reached an average of US$ 218. This amount is equivalent to the minimum rental value of a home in districts specified in the DCE (US$ 200). It is also similar to the average expenditure of workers with tertiary education on housing rental in Costa Rica.[16] These results are in line with those remarked in previous sections and reflect the fact that monetary rewards (*score assigned to teaching category* and *borrowed housing*) were the most important incentives to teachers.

Table 7: Willingness to pay for each teaching incentive to move outside the Central Region of Costa Rica in US$. Teachers willing to move [a/].

Average monthly salary at baseline=US$1.659[b/].

	Mean WTP	Lower bound 95% CI	Upper bound 95% CI	S.E
Score assigned to teaching category	281***	210.76	351.17	35.82
Borrowed housing	218***	168.08	267.99	25.50
Transportation	96***	61.95	130.22	17.41
Technological and material resources	75***	35.32	114.84	20.29
Working with highly qualified peers and pedagogical support	90***	56.20	123.17	17.10
Number of observations	3 706			
Number of teachers	209			

Notes: Calculations made using a non-parametric bootstrap in Stata, 500 repetitions. Standard errors in parentheses indicate the estimated uncertainty, * p<0.1; ** p<0.05; *** p<0.01.

[a/] It only includes teachers who would accept to move under some of the proposed contracts and would not opt-out [b/]The full-time monthly average salary is calculated with the survey data.

5. Discussion

It is important to notice that although this paper is driven by the importance of teachers' mobility preferences, it can be relevant for analyzing other workers' mobility in

[16] Calculated as the present value (2019) of the corresponding information available in the Encuesta Nacional de Ingresos y Gastos de los Hogares-ENIGH, 2014.

the public sector. Many public sector activities and institutions are organized with a similar central allocation mechanism in which workers are permitted to move between different locations depending on their seniority, while incentives for employees are rather limited (Barbieri et al. 2011). Moreover, our analysis can be generalized to cases where the allocation of workers is not centralized.

Our results identified the most suggestive incentives to attract teachers to schools located in disadvantaged areas of Costa Rica showing that monetary incentives were the most attractive for teachers. In the words of Rosen (1986, p. 647), these incentives proved to compensate for the "disutility" of accepting those positions.

Concerning the *bonus*, Hanushek et al. (2004) and Goldhaber et al. (2018) have recommended using salary differences as a policy instrument to promote the mobility and retention of teachers in unattractive working conditions. Overall, we found that the marginal effect of this incentive on teacher preference was decreasing at the last level (*50% bonus*). Regarding these decreasing returns, Kolstad (2011) obtained the same result in a DCE for attracting health workers to rural positions. His study concluded that, after a certain threshold, salary increases based on bonuses alone were no longer efficient and it was more appropriate to focus on other types of incentives. Additionally, Günther et al., (2010) pointed out that the decrease in marginal utility, that we found, could be taken as an indicator that the width of the income level range of the experiment had been well defined.

In developing countries, teachers' preference for monetary incentives is not surprising, because teachers suffer from economic disadvantage compared to other professionals. In Costa Rica, the average salary of teachers represents 86% of the mean salary of workers with tertiary education (ENAHO, 2019). The compensation difference that teachers receive for working in areas outside the Central Region does not exceed 20% of their baseline salary (ENAHO, 2019; OECD, 2017).

The results we obtained on the preference for incentives based on the *score assigned to teaching category* have also been observed in the United States. Asch (2005) found that promotion in category motivated teachers and favored their productivity. Smith & Ingersoll (2004) reached similar conclusions and pointed out that promotion on the professional scale was key for the retention of experienced teachers in schools with disadvantaged populations. In particular, Fagernas & Pelkonen (2012) add an essential reflection for developing countries: in regions with high levels of poverty, the opportunities to continue studying for workers who wish to improve their training and advance in their professional careers are scarce.

Borrowed housing was revealed as a major incentive. Bradley et al. (2006) had also found that the subsidy for teachers' household expenses in remote and rural locations was a fundamental complement to the salary to attract and retain teachers. In Costa Rica, access to decent housing in places with high poverty rates is difficult (as observed in household surveys that collect data on housing conditions, ENAHO, 2019). The provision of a *borrowed housing* as an incentive has the advantage that the investment made by the system remains as an asset that can be reused.

Non-monetary incentives had a comparatively lower effect on teachers' preference for contracts than monetary ones. However, our results revealed that non-monetary incentives are important as a complement to the monetary ones. In the qualitative design phase of this study, teachers pointed out the complementary value of these incentives (in particular, *peer and pedagogical support* and the provision of *technological and material resources*). The results of the *take-up rate* simulations confirmed this complementary role when analyzing packages that combined monetary and non-monetary incentives.

Previous literature has highlighted the importance of non-monetary incentives. Concerning *peer and pedagogical support*, Falch & Strom (2005) in Norway and Ingersoll

& Smith (2004), in the United States, found that support among teachers increased the likelihood of remaining in their positions. These studies indicated that the combination of different forms of peer collaboration within the school and throughout the system increased the commitment to the job. Collaboration among co-workers reduced teachers' sense of isolation in difficult contexts.

Regarding the provision of *technological resources and pedagogical materials*, empirical works have shown that this variable significantly influences the permanence of teachers in schools. Vegas & Umansky (2005) found that the deficiencies in basic materials in Honduras, Nicaragua, and El Salvador made it difficult for the teachers to plan the lessons and the dynamics in the classroom. This situation reduced the effectiveness of the teachers' work and discouraged them. In the United States, Buckley, et al. (2005) found that teachers' assessment of lack of access to texts and technology was a predictor of their decision to leave their position.

Regarding gender differences when deciding about contracts in the teacher's labor market, as a first result, women were less likely to be willing to move. Among those accepting to leave the Central Region, women were more attracted by monetary compensation. The heterogeneity of preferences and the costs associated with mobility can relate to the role of teachers in their households. In Costa Rica, women spend more time than men in childcare. This could imply that, in locations where the care network (family and daycare facilities) is less accessible, women must consider that cost, or the cost to commute periodically from the place of work to the Central Region (ENAHO, 2019). Ajzenman et al. (2021b), in Peru, find that female teachers have less flexibility and are less likely to select schools with longer commuting times as this represents a high cost. Fagernäs & Pelkonen, P. (2012) in India, found that female teachers would accept moving to a remote location for salary differentials from 24% to 73% depending on their place of origin.

The compensating differential theory predicts that the characteristics of the incentives can attract the desirable (self-selected) teachers' profile to work in schools that are unattractive to the average teacher (Eriksson & Kristensen, 2014). The possibility of designing packages that combine different incentives and the quantification of teachers' preferences for these combinations make DCEs a useful and versatile tool for planning mobility scenarios. The recruitment of the best teachers to work in schools that concentrate the most disadvantaged students has proven to be an essential instrument in achieving educational equity. Given that education is the main determinant of future wage differentials and that teachers are the most important factor influencing learning (Gimenez et al., 2019), the design of teaching recruitment instruments becomes an important tool to enhance equity in Latin American countries, which has some of the highest global levels of inequality in income distribution.

6. Conclusions and Policy Implications

International empirical research has shown that high job insecurity and low-powered incentive structures are consistently related to inefficiencies in the public sector, especially in developing countries (Finan et al., 2017). In this regard, policy reforms oriented to public teaching careers in Latin American countries provide suggestive evidence of the improvement of teacher candidate quality as well as student outcomes (Brutti & Sánchez Torres, 2022).

The improvement of the Costa Rican educational system has been a primary political objective for the governments that have ruled the country in recent decades. [17] Significant progress has been made in expanding the educational offer, building schools,

[17] To the point that, in 2011, the Legislative Assembly reformed the Political Constitution, so that the Costa Rican State would dedicate, annually, 8% of the Gross Domestic Product to public education.

and increasing the number of teachers. Today, the vast majority of students complete primary education, and many enroll in secondary education.

As the goal of universal access to the basic educational levels has become less urgent, the policy's emphasis has shifted to educational quality. The country has not yet been able to close the gap in terms of educational standards that exist with respect to developed economies. International knowledge tests show that skills acquired per year of schooling are lower than the average for OECD countries (OECD, 2019).

Empirical evidence reveals that teachers are the most important educational input when explaining the country's student performance differences (Gimenez et al., 2019). The effective distribution of teachers between schools becomes, therefore, a key instrument for educational policymakers. A well-designed incentive system will help to recruit and retain the best teachers in disadvantaged zones and to increase learning, educational equity, and well-being.

Economic constraints in developing countries like Costa Rica impose the need for teacher allocation policy designs that depend not only on monetary incentives. The research carried out relies on hypothetical scenarios presented through questionnaires and not actual incentive options made available to teachers. However, in the absence of rigorous evaluations using revealed preference data on different incentive schemes, the DCEs provide an alternative method for examining the likely effects of mobility incentives.

The results showed that the monetary incentives have the greatest effect on the acceptance of contracts by teachers, but that non-monetary incentives were also relevant for teachers. Actually, the package of nonmonetary incentives resulted in a higher probability of acceptance than the highest bonus option. Simulations with packages that combine incentives allowed us to conclude that it is possible to achieve high acceptance probabilities (*take-up* rate) through the combination of monetary and non-monetary incentives. The latter

is especially relevant in educational systems with financial limitations and great internal inequalities, such as those in Latin America (OECD, 2018). A little-researched aspect of the literature on the teaching labor market is gender differences in decision-making about contracts. In our results, women were more reluctant than men to move, and showed a significantly higher preference than men for the lower percentage salary *bonus* (30%), the score assigned to the *teaching category*, and the supply of *transportation*.

The first contribution of our findings is that they exhibit the possibility of reducing dependence on exclusively monetary options when designing policies to motivate teachers' mobility. The combination of different monetary and non-monetary alternatives in packages for individual teachers gives the system flexibility to offer incentives according to its financial capabilities and has been less addressed by the literature (Evans & Mendez-Acosta, 2023). Additionally, previous studies have shown that incentives to individual teachers designed for a specific purpose have proven to be more cost-effective than other traditional educational policies like across-the-board wage increases (Santibanez,2020) and class-size reductions (Duflo et al., 2015).

A second contribution for policymakers is that the use of incentive packages offers versatility to attract the adequate profile of teachers according to the purposes of the educational policy. For example, teachers with vocation and a genuine interest in working with peer-to-peer, who use pedagogical materials in the classroom and use technology to make a difference in low-performing schools.

The main limitation that we identified in the results is the potential underestimation of the non-monetary incentives because teachers have a negative opinion of the non-monetary support they receive from the Ministry of Public Education (e.g. training, peer collaboration, pedagogical support from supervisors) (Lentini, 2019). Thus, more public resources than necessary would be spent by oversizing the importance of monetary

incentives, which usually represent the largest expenditure. On the other hand, this analysis deals with the impact of different packages options, not the costs of implementing them. For any government with budget constraints, it would be advisable to do a thorough analysis of the net gain (loss) from implementing different packages before concluding what is the most feasible to implement.

As in other Latin American countries, in Costa Rica, there is a huge gap in terms of educational quality between schools situated close to urban areas and schools in peripheral and poorly communicated areas. Peripheral schools concentrate socio-economically disadvantaged students who obtain poorer academic results. The instruments we have analyzed allow us to attract and retain skilled teachers in these schools, and therefore to tackle three main problems their students face. First, reducing the high rates of grade repetition. Second, combating school dropout. Third, improving the results in the exams for entrance to post-secondary education and therefore facilitating access to jobs that require higher educational qualifications and allow for higher salaries.

Although the study uses data from Costa Rica, the results are relevant from an international perspective. The DCE methodology is agile and economically affordable, two characteristics that are especially useful in countries with high financial limitations. Therefore, this instrument becomes a valuable mechanism to achieve educational equity and promote inclusive socioeconomic development.

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