Unemployment Insurance in Chile: Lessons from a High Inequality Developing Country

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Abstract

One of the most complex social policy issues that developing countries commonly face is the question of how they can protect the unemployed. However, the analysis of unemployment insurance (UI) in developing economies with large informal sectors is in its infancy, with few papers providing solid empirical evidence. This paper makes several contributions to the development literature: first, it applies Chetty's 2008 landmark work on UI to a developing country (Chile) and shows that the moral hazard effects expected by policy makers, who designed the system are minimal, while liquidity effects were entirely neglected. By means of an RDD, it analyses the Chilean UI system using a large sample of administrative data, which allows for an extremely precise analysis of how the system is working, thus providing invaluable empirical lessons for other developing countries.

Second, this paper shows that it is not enough merely to quantify an effect such as moral hazard, but to understand its causes and implications. An extended unemployment period stemming from moral hazard has extremely different welfare implications than one stemming from a liquidity effect and should therefore result in different policy recommendations.

Third, our results also highlight that the Chilean UI system is regressive overall, as it protects workers with higher income levels and more stable jobs much more than it protects vulnerable workers, who are also much more likely to become unemployed.

Fourth, this paper shows that it is essential that developing countries should take into account the specific labour market and macroeconomic context when designing social policies as the incentives embedded in such a policy may not be enough to compensate for the limitations that arise from the structure of a labour market.

This research thus has implications for many developing countries, which may also be considering the implementation of some form of UI and/or the partial or complete replacement of existing severance pay legislation with continuous contributions to individual savings accounts, as recommended by the international development institutions. Furthermore, even high-income developing countries, such as Chile, cannot rely on unemployment insurance alone when it comes to protecting workers from the fallout of an economic crisis or rapid changes in the labour market that generate unemployment. Any UI system must also be linked to other social protection mechanisms to provide complimentary benefits to workers with precarious jobs.

Keywords: Unemployment Insurance; Latin America; Social Policy in Developing Countries; Welfare Systems; Moral Hazard vs Liquidity; Inequality

1. Introduction

One of the most complex social policy issues that developing countries commonly face is the question of how they can protect workers, who become unemployed. This is a vital question in developing countries, which rarely have instituted fully fledged welfare states.[1] In the broader context of social protection systems, workers must be protected from unemployment produced by globalisation, technological advances and even global pandemics such as the Covid19 outbreak. In fact, since the beginning of the Corona Depression, countries all over the world have used UI systems to pay subsidies to furloughed workers (Caram & Pupo, 2020; Otero, 2020).

However, protecting unemployed workers in developing countries is not an easy task. As Sehnbruch et al. (2019) explain in detail, less developed countries generally do not have the institutional capability to distinguish between workers who are genuinely unemployed or working in the informal sector with low earnings. In developed countries, governments monitor the availability of workers to accept a new job as well their job search effort. Developing countries, however, do not have the institutional capacity to do this. Therefore, a concern widely expressed in the literature on unemployment insurance is that workers could receive insurance benefits without really looking for a new job. This phenomenon is referred to as “moral hazard” in the literature.

As a result, much expert attention in developing countries, focuses on whether unemployment insurance systems can be designed in a way that limits moral hazard. After 2006, however, landmark papers by Chetty & Looney (2006) and Chetty (2008) recognised the economic *and* social value of unemployment insurance. Their research shows that the potential welfare gains can be particularly significant in developing countries, where many workers live in households close to the subsistence line, and are therefore particularly vulnerable to economic shocks, which can lead to costly expenditure reductions, such as taking children out of full-time education and putting them to work. Preventing this type of expenditure reduction is referred to as “consumption smoothing” in the literature.

This paper applies and tests Chetty’s 2008 paper on optimal UI using administrative data from a UI system in a developing country. To the best of our knowledge, this paper is the first to do so. It should therefore provide researchers of social policy in developing countries with valuable insights on the role of UI in the context of constructing welfare states.

There is now a consensus in the policy making literature that some form of two-tiered UI provision in developing countries would be desirable. This should feature (1) a mandatory individual savings account (ISA) funded by contributions from individual workers and/or their employers that would not be redistributive and (2) a risk sharing funding mechanism that is redistributive and financed through taxes, which steps in when savings accumulated in the ISA run out.[2] The idea put forward by this literature is that such a structure would protect workers who become unemployed without incurring significant moral hazard in developing countries in which the combination of large informal sectors (where workers could

[1] As Berg and Salerno (2008) have argued, governments in developing countries previously dealt with economic shocks principally by subsidising jobs or generating emergency employment programmes.

[2] Most recently, such as design is recommended by Duval & Loungani (2019) from the IMF. The World Bank has made a similar recommendation**Error! Bookmark not defined.** (Ribe et al., 2010).

hypothetically work while receiving UI benefits) and limited institutional capacity to monitor the behaviour of the unemployed make the establishment of traditional risk sharing, redistributive UI systems unfeasible

However, most of this literature is based on *theoretical policy recommendations and not on empirical evidence*. As Schmieder & von Wachter (2016: 577) point out: "the analysis of the role of UI in developing economies with large informal sectors is in its infancy." Studying this subject is particularly important given the "sizable interest by many emerging market countries in developing UI systems." In fact, several developing countries have already instituted such two-tiered systems as described by Duval & Loungani (2019). They include Brazil, Chile, Colombia, Jordan, and Mauritius. Unfortunately, with the notable exception of Brazil[3] and Chile[4], little empirical research has been undertaken on these systems that analyse how they are functioning in practice. In this context and considering Chile's role as a Latin American pioneer of social insurance systems based on individual savings accounts, the country's UI system is widely regarded as a model for other countries in the region as well as for other developing countries as it is assumed to have achieved a near optimal design that would lower the risk of moral hazard, while also providing an adequate degree of social protection for unemployed workers (ILO, 2012 and Vodopivec, 2013). However, so far, this conclusion is not based on reliable empirical evidence, especially as the Chilean unemployment insurance system has only recently reached a sufficient degree of institutional maturity to allow for the analysis of whether these claims about its optimal design are indeed justified.

This paper therefore takes advantage of the fact that – rather unusually – the Chilean government provides access to administrative data from the country's UI system, which allows for a very precise analysis of how the system is functioning. This system is based on a combination of individual unemployment insurance savings accounts and a so-called 'solidarity fund', designed to provide minimum levels of coverage to workers who have not been able to accumulate enough savings in their individual accounts to cover a limited period of unemployment. Both workers and employers contribute to these funds, and the government provides the solidarity fund with some additional fiscal support.

Using a regression discontinuity design (RDD) following Lee and Lemieux 2010, this paper explores whether the system has indeed minimised moral hazard, and, if so, to what extent. To access the solidarity fund, a worker has to have made at least 12 monthly contributions to his or her individual savings account (ISA). This study exploits this discontinuity to study differences in the length of the unemployment period following an employment relationship

[3] Brazil has an UI system similar to the two-tiered system described by Duval & Loungani (2019) although it consists of two separate institutions that are not integrated into a single system: The ISA mechanism in Brazil consists of the Fundo de Garantia do Tempo de Serviço (FGTS) and the risk sharing UI system is the separate Fondo de Amparo al Trabajador (FAT). For an analysis of these systems, see Hijzen (2011), who uses panel survey data and Gerard & Naritomi (2019).

[4] Hartley et al., 2011 and Huneeus, Leiva and Micco (2012) analyse the Chilean UI system with administrative data from before 2010 when the system was still being rolled out and had not yet fully matured; and Nagler (2015) analyses the system with survey data. Sehnbruch et al. (2018) is the only study that uses recent administrative data from a period when the UI system had already matured and shows that the system has achieved an extremely low level of coverage among unemployed workers.

that was concluded. Given the nature of the UI assignment, an RDD is a common tool used for quantifying the impact of these programmes on behavioural outcomes.[5]

In addition, it analyses the liquidity effects of the UI system, which has been ignored by the literature.[6] Previous studies, such as Hartley et al. (2011) and Huneeus et al. (2012) highlight the problem of self-selection among workers who use the different components of the UI and those who do not. But they do not discuss the fact that these effects are minimal, nor do they examine whether the behaviour of the unemployed may be motivated by a liquidity effect.[7] This paper analyses the longitudinal administrative data produced by the UI system, to show that such a liquidity effect does exist, but only among a very limited group of workers, who are first time users of the system.

This paper therefore contributes to the existing literature in several ways: First, it undertakes an analysis of the Chilean UI system using a large sample of administrative data, which allows for a much more precise analysis of how the system is working, providing useful empirical lessons for other developing countries. Second, the RDD used in this paper shows that the effect of moral hazard on unemployment duration is in fact minimal, while a liquidity effect – neglected by other studies – does exist. Third, and most importantly, this paper contributes to public policy research by showing that it is not enough merely to quantify an effect (as most economists do), *but to understand its causes and implications.* An extended unemployment period stemming from moral hazard has extremely different welfare implications than one stemming from a liquidity effect and should therefore result in different policy recommendations. In addition, our results also show that the Chilean UI system is regressive overall, as it protects workers with higher income levels and more stable jobs much more than it protects vulnerable workers, who are also much more likely to become unemployed.

It is therefore crucial that policy debates on the optimal design of UI systems in developing countries should take into account the specific labour market and macroeconomic context of an individual country when designing social policies *as the incentives embedded in a social policy may not be enough to compensate for the limitations that arise from the structure of a labour market* (Arza, 2008). Sehnbruch et al. (2019) show that for reasons of political economy and expediency, the Chilean UI was designed with the specific intention of preventing moral hazard. This paper builds on this work and shows that the moral hazard effect displayed by workers is so minimal as to be negligible, while the precariousness of jobs in the Chilean labour market combined with the benefit conditions imposed by the system result in the most vulnerable workers being protected the least by the system.

Overall, this research thus has implications beyond the Chilean case, especially for other developing countries, which may also be considering the implementation of some form of UI. It is also relevant to policy debates, which are considering the partial or complete replacement of existing severance pay legislation with continuous contributions to individual savings

[5] See for example Dieterle et al. (2018); Lalive (2007); Schmieder & von Wachter (2016).

[6] See for example Huneeus, Leiva and Micco, 2012; Vodopivec, 2013. Notable exceptions are Hijzen, 2011; and Gerard and Naritomi, 2019.

[7] These papers also examined this question, but used data from 2002-2009, a period during which the system was still being implemented and gradually rolled out through the incorporation of new contracts. This distorts their results because a greater proportion of workers contributing to the system had short-term employment contracts.

accounts, as recommended by Heckman and Pages (2000) or Holzmann and Vodopivec (2012). Finally, it shows that even high-income developing countries, such as Chile, cannot rely on unemployment insurance alone when it comes to protecting workers from the fallout of an economic crisis or rapid changes in the labour market that generate unemployment. Any UI system must also be linked to other social protection mechanisms such as universal basic incomes, earned income tax credits and emergency employment programmes to provide complimentary benefits to workers with precarious jobs.

The paper proceeds as follows: section 2 discusses the literature relevant to this paper. Section 3 explains the particularities of the Chilean unemployment insurance system and presents a descriptive analysis of how the system works in practice. Section 4 then presents the analytical model and the data used, Section 5 analyses its results and shows that the moral hazard effect on workers who benefit from the system is so minimal as to be irrelevant in practice. By contrast, the liquidity effect of the UI system on low income workers is much more significant, a fact that was previously ignored by the literature. Section 6 concludes by discussing the implications of this research for other developing countries.

2. Theoretical Approaches to Unemployment Insurance

In developing countries, economic crises can lead to sharper increases in unemployment than in developed countries, as even salaried workers are often hired on a precarious contractual basis, such as fixed-term contracts or subcontracting and can thus be made redundant quickly (Sehnbruch et al., 2020). Also, there are few labour market institutions, such as unions, which can negotiate wage reductions instead of widespread redundancies (Colombo et al., 2019).

Increased unemployment can therefore push more workers into the overcrowded and unproductive informal sector (Udall and Sinclair, 1982), which increases the risk of falling below the poverty line in countries which rarely have fully fledged welfare states and are still debating the merits of targeting resources versus establishing universal welfare benefits (Riesco, 2009).[8] Workers also lack access to other insurance systems, credit markets, or personal wealth, particularly affecting young workers who have just entered the labour market (Cho & Newhouse, 2013). Thus, as Chetty & Looney (2006) argue, the potential welfare gains from UI are greater in emerging markets and developing economies than in advanced economies. As a result, governments in developing countries are increasingly looking at establishing UI systems to contain the social cost of economic downturns (Schmieder and von Wachter, 2016). However, as Sehnbruch et al. (2018) show, since there are few empirical studies of how unemployment insurance works in lower income countries, where governments are strongly influenced by empirical evidence from developed countries.

In the latter, the theoretical literature on UI systems has historically focused on the optimal design of UI (Hopenhayn & Nicolini, 1997) by examining the relationship between the contribution requirements to UI systems, the duration of unemployment benefits and job search behaviour through stylized models. Recent papers have extended their models to

[8] Kingdon and Knight (2004) show that this is not the case for South Africa, where unemployed workers do not enter the informal labour market due to barriers such as credit constraint or perceived insecurity.

include biased beliefs about employment prospects (see, e.g., Spinnewijn, 2015) or by adapting them to include dynamic profiles (see e.g., Landais, 2015; Kolsrud *et al.*, 2018).[9] The goal of these "optimal designs" is twofold: to provide liquidity and avoid adverse incentives when searching for a new job (Fredriksson & Holmlund, 2006). However, initially, the main concern in the literature has always focused on the latter. Hopenhayn and Nicolini (1997 and 2009), for example, argue that unemployment benefits should incorporate a decreasing replacement ratio, together with a future wage tax that increases with the duration of unemployment. Feldstein & Altman (2007) even went as far as to suggest that individual savings accounts should be established for workers so that they can save for the possibility of unemployment, with the government extending potential loans against future earnings (at a premium) when individual accounts are depleted.[10] This more radical solution thus proposes to eliminate any social risk sharing associated with traditional unemployment insurance systems so as to avoid the potential of moral hazard.[11]

These arguments are based on research which shows a spike in the hazard rate (i.e., in job search effort) around the time when social benefits run out in countries such as Austria or Germany (Card et al., 2007; Schmieder et al., 2012). However, attributing this spike only to moral hazard ignores the existence of other issues, such as liquidity constraints related to the fact that better unemployment benefits reduce the pressure to accept the first job offer received, which in some cases can explain up to 60% of the increase in unemployment durations (Chetty, 2008; Landais, 2015; Landais & Spinnewijn, 2019) Both the 'moral hazard effect' and the 'liquidity effect' result in a longer non-contribution period, but their welfare implications differ greatly.

While most of the literature on unemployment insurance focuses on contingency policies (conditions and benefits) and their implications for moral hazard, a more recent strand of literature has examined consumption responses to income changes and has highlighted the sensitivity of consumption to liquidity. This literature focuses on the positive welfare effects of unemployment insurance: providing liquidity and limiting the need for precautionary savings (Jappelli & Pistaferri, 2010). Gérard & Naritomi (2019) show that Brazilian workers eligible for both unemployment insurance and severance pay increase their consumption at layoff by 35% and suffer a 17% drop after they stop receiving benefits. Similar patterns have been found in the United States (Ganong & Noel, 2019) and Sweden (Landais & Spinnewijn, 2019). By focusing on consumption patterns, this line of research shows the importance of liquidity constraints as well as looking at the timing of unemployment benefits in addition to benefit conditions and levels.

However, the public policy debate on ISA based systems in developing countries either predated this more recent literature or simply did not consider the arguments put forward by Chetty (2008) on liquidity constraints.[12] Most of the literature that was influential in developing countries even begins with the basic argument that there is a genuine role for State provision of UI as adverse selection criteria make it impossible for the private sector to provide such

[9] For an excellent overview of this literature, see Schmieder and von Wachter (2016).

[10] See, for example, van Ours and Vodopivec (2006) on Jordan.

[11] See also Orszag and Snower (2002)

[12] Note that these findings are replicated by Card et al. (2007) for Austria and Basten et al. (2016) for Norway.

insurance.[13] Second, this literature reiterates how labour markets in developing countries are different from those in advanced economies, as they are characterised by both high levels of informal employment and low levels of institutional capacity, thus generating a higher potential risk of moral hazard.[14] These experts therefore suggest that self-insurance schemes based on Individual Savings Accounts (ISAs), complemented with some state funding (as in the Chilean UI system) would work best in developing countries. Blanchard and Tirole (2008), on the other hand, warn that the use of individual savings accounts can also result in problems such as firms not internalising the cost of layoffs, resulting in excessive job destruction. Ferrer and Riddell (2011)) further suggest that ISAs could contribute to promoting the informal sector as employers attempt to avoid the cost of contributing to the UI system.

Four conclusions can be drawn from the literature on UI in developing countries: first, a theoretical concern about moral hazard outweighs welfare issues, in particular the potentially positive impact of liquidity effects as specified by Chetty (2008). Second, as Schmieder & von Wachter (2016) have pointed out, there is a dearth of empirical literature on how UI systems really function in developing countries – as opposed to theoretical discussions of how they could function. In particular, studies analysing administrative data from UI systems are scarce.[15] Third, to the best of our knowledge, there are no empirical studies of the complementarity between UI systems and the characteristics of the labour markets in which they operate. This means that optimal insurance systems can be designed in theory that then fail to cover the unemployed as the conditions they impose on potential beneficiaries are not compatible with employment conditions in precarious labour markets (Robalino, 2014; Sehnbruch et al., 2019). Fourth, despite warnings from some authors, such as Blanchard and Tirole (2008), there appears to be a consensus in the literature that systems which combine ISAs with some form of additional government support would work best in developing countries. Overall, the existing literature *on developing countries significantly underestimates the role of UI as a social policy* as well as its potential to address liquidity constraints resulting from loss of employment.

In the case of the Chilean UI, Sehnbruch et al. (2018) chronicle the policy debate that preceded the design and establishment of the UI system and was entirely focused on the subject of moral hazard, completely ignoring the possibility of liquidity arguments. Consequently, the Chilean UI system is based on ISAs, staggered benefit payments, and a minimal risk sharing component. So far, the existing literature has concluded that the Chilean system provides reasonable protection and limited distortions (Berstein, 2010), even though some studies argue that it has not eliminated the issue of moral hazard (Reyes-Hartley et al., 2011 and Huneeus et al., 2012). However, these papers have not at all considered the implications of liquidity effects, as they continue to attribute all changes in unemployment durations to moral hazard. This paper shows that the study of the Chilean UI system requires a more nuanced approach, particularly regarding the use made of its solidarity component, as well as its effects on job search efforts. If the Chilean UI is to be touted as a “model” for

[13] The most recent illustration of this argument is Duval and Loungani (2019), but Feldstein and Altman (2007) and Vodopivec (2013) also made a similar argument.

[14] See Feldstein and Altman, (2007); Ferrer and Riddell, (2011); Vodopivec, (2013); Duval and Loungani, (2019).

[15] Exceptions to this rule are Sehnbruch et al. (2018 and Gerard & Naritomi (2019).

other developing countries, it is crucial to understand how this system works in practice, not just on paper.

3. Background to the Chilean case and how the insurance system works

The Chilean UI covers all dependent workers between the ages of 18 and 65, who work in the private sector and who have been unemployed for at least 30 days. This means it excludes the self-employed (or informal workers), domestic service workers (who have an individual savings account mechanism) and the public sector.[16]

Since its institution in October 2002, all new employment contracts have been contributing to the UI system.[17] The amount each worker contributes to the system depends on their type of contract. Workers with open-ended contracts contribute 0.6% of their taxable income to their own ISA, while employers contribute 1.6% to the same account and 0.8% to the solidarity fund, resulting in a total contribution of 3% per worker. Workers with fixed-term contracts, on the other hand, do not contribute to the system at all, but their employers contribute 2.8% of their taxable income to their ISA and 0.2% to the solidarity fund, also resulting in a 3% contribution per worker. These contributions are summarised in Table 1.

Table 1: Contributions to the UI system by type of contract

Open ended contracts			
	Individual Account	Solidarity Fund	Total
Worker	0.6	0.0	0.6
Employer	1.6	0.8	2.4
Total	2.2	0.8	3.0
Fixed term contracts			
	Individual Account	Solidarity Fund	Total
Worker	0.0	0.0	0.0
Employer	2.8	0.2	3.0
Total	2.8	0.2	3.0

Source: Summarized from law bill that creates the UI system (number 19728).

In addition, the government contributes a yearly lump sum to the solidarity fund of approximately US$1.5m. Both the contributions to ISAs and the solidarity fund are invested

[16] According to official data from Chile's National Institute of Statistics, in 2018, 27.8% of workers in Chile are informal workers, 10.9% are employers or formally self-employed, 2% are formal domestic service employees and 10.5% work in the public sector. This means that only 48.8% of the total labour force is covered by this UI system.

[17] Only a minimal number of contracts voluntarily became part of the system.

in money market instruments to generate a minimum return over time. Lastly, if a worker does not use their ISA at retirement age, all funds are transferred to their individual pension fund.[18]

To withdraw money from the UI system, workers must have contributed to it for at least 12 months over the course of the last 24 months in the case of workers with open ended contracts (6 months in the case of fixed term workers). Only the last three of these contributions must be continuous and from the same employer. Workers only have access to the solidarity fund if they lose their job as a result of a redundancy clause, not if they voluntarily resign from employment.

The amount and number of payments that a worker can ultimately withdraw from the UI system thus depends on the type of contract held before becoming unemployed and on the amount of savings accumulated in his or her ISA. Replacement rates then begin at 70% of the prior wage, decreasing by 5% each month until reaching a minimum of 30%. If a worker has sufficient savings, the number of withdrawals that can be made is theoretically unlimited, although after the seventh month of unemployment the replacement rate is maintained constant at 30 per cent.

If the funds accumulated in a worker's individual savings account are insufficient to fund a period of unemployment and the worker was made redundant, s/he has the right to obtain additional benefits from the system's solidarity fund. The amount and number of payments made by this fund provide payments for up to five months that are equal to what a worker would obtain from his or her ISA, subject to legal minimum and maximum amounts (For details, see Sehnbruch et al. (2019)). Unemployed workers thus only receive payments from the solidarity fund if their own savings have been used up. It is this inclusion of a Solidarity Fund that distinguishes the Chilean UI system from other such systems in Latin America and that led to its description as a “model” for other developing countries.

3.1. Data used in this study

This paper uses the administrative database of the Chilean UI system, which is managed by the *Superintendencia de Pensiones*, the institution that also supervises Chile’s pension system. This database gathers monthly information on income, type of contract, economic sector, among other characteristics for all formal workers in Chile. It also provides information on the requests made to the UI system by these workers, and on the benefits they received. The database is updated every year and can be downloaded online. [19]

The *Superintendencia de Pensiones* has made available smaller samples of the complete UI database, specifically 3%, 5%, and 12% random samples drawn from the complete administrative dataset. This paper combines the 3% and 5% samples to work with an 8% sample of workers.[20] The sample starts in 2002 with the creation of the UI system and runs

[18] All contributions are limited to a maximum of 11 years. If a worker stays in the same job for more than 11 years, contributions to the UI system cease as it is assumed that 11 years allow for a sufficient accumulation of funds to cover the eventuality of unemployment (Beyer, 2000; Acevedo et al., 2006).

[19] The database can be downloaded at www.spensiones.cl/apps/bdp/index.php.

[20] To create a larger sample, we merged the two sample databases between which there was no overlap of cases. We did not, however, add the 12% sample to our database as this made it unwieldy and exceed the capacity of our computers.

until March 2018. In its raw form, the database includes just over 800,000 workers with 50 million monthly contributions and almost 650,000 benefit claims made.

The database includes monthly information on each employment relationship. It also includes information on benefit claims. The raw data comes in 6 different files, which include contribution histories, benefit claims, UI payments, and UI rejections. We merged these databases to be able to undertake this analysis. This process involves harmonising each of the files to properly merge individuals across them in the correct time period. The final result is a dataset that includes monthly contributions for each worker, with information on whether they made a benefit claim after their employment ended, how many payments they received and from which source. For our analysis, we focus on the last month of employment, so we work with one observation per employment relationship.

Note that this paper uses the terms "unemployment" and “unemployed” loosely when referring to workers, who stop contributing to this UI system. In fact, the nature of our administrative dataset does not allow us to discern whether workers are genuinely unemployed while not contributing to the system (i.e. not working and looking for a new job), or whether they are inactive or working informally. They could also be working in other sectors not covered by the UI system (e.g. domestic service, armed forces, or the public sector). For the purposes of linguistic simplicity, we nevertheless refer to workers not contributing to the UI system as “unemployed”.

To account for the problem of including people working outside the UI context (i.e., private formal workers), we focus on workers who have an unemployment duration of at most 24 months. These are workers that reappear in the data (or stopped working in the last two years of data) thus minimizing the issue of working outside of the formal private job market. To further reinforce the idea that we are focusing on workers that go back to work formally, the appendix replicates our results for unemployment durations of at most 12, 6, and 3 months, with similar results.

3.2. Benefits paid by the UISA

The four main factors that determine benefits received from the UISA are the reason for unemployment, the duration of the previous job and its wage level, and the contractual status the worker had prior to becoming unemployed (open ended or fixed term contracts). These are therefore the conditions that have to be taken into account when analysing the empirical evidence that relates to the functioning of the Chilean unemployment insurance system.[21] Table 2 compares the employment conditions of all employed workers with those of unemployed workers (or of the jobs they held prior to becoming unemployed), who constitute 10.5% of the sample. As we can see, the jobs held by workers who become unemployed are significantly more precarious than those of employed workers. For example, overall, 70% of workers contributing to the insurance system have open-ended contracts, while 30% have fixed-term contracts. Among workers who become unemployed, by contrast, only 26% had open-ended contracts. Furthermore, the average income levels of workers who became unemployed are significantly below those of other workers (602 vs 1243 USD). The same goes for the average duration of the job prior to becoming unemployed and the proportion of

[21] A more detailed description of how the Chilean UI works (including its linkages to the services of municipal employment services and vocational training) can be found in Sehnbruch et al. (2019).

workers who contributed for less than three months to the UISA prior to becoming unemployed. Overall, Table 2 shows that, on average, the employment conditions of workers, who become unemployed are significantly more precarious than those of workers who are employed.

Of the total number of employment relationships in January 2018, only 0.6% made an insurance claim. Here, it is important to note that the average employment conditions of this group of workers are significantly better that those of terminated workers in general. Table 2 shows that 60% of these workers had open-ended contracts, and their average income was USD 612. However, the duration of the jobs they held prior to becoming unemployed is also very low. It is this low level of job duration that explains why so few workers claim benefits from the insurance. Although the condition that workers must have contributed for a minimum of 6 or 12 months (fixed or open-ended contracts respectively) is not particularly stringent in the comparative context of UI systems (Asenjo & Pignatti, 2019), the short duration of employment in Chile means that very few workers are able to comply with this condition before becoming unemployed, especially as the unemployed are more likely to have held precarious jobs to begin with.

Table 2: Characteristics of Employed and Unemployed workers (Raw data - January 2018)

		Type of Contract %	Income (USD)	Average Age	Duration	% Duration of less than 3 months
All Employment Relationships	*Open-ended*	69.8%	1460.9	39.3	41.1	5.7%
	Fixed term	30.2%	738.7	35.8	8.5	42.8%
	Total	100%	1243.3	38.2	31.3	16.9%
Terminated Employment Relationships (10.5%)	*Open-ended*	26.4%	816.3	37.1	22.4	20.6%
	Fixed term	73.6%	525.4	34.0	3.8	69.5%
	Total	100%	602.2	34.8	8.7	56.6%
Made a UI request (0.6%)	*Open-ended*	60.4%	669.5	37.3	35.3	7.2%
	Fixed term	39.6%	525.4	37.8	9.0	28.7%
	Total	100%	612.5	37.5	24.9	15.7%

Source: Authors' own calculations using administrative data from the Chilean Unemployment insurance system. January 2018 exchange rate (602.3 CLP). Because of data management constraints, this table uses the 3% sample only.

As discussed above, to request funds from the UISA system, workers have to satisfy certain conditions, which depend on the type of contract they had prior to becoming unemployed, the number of contributions made to the system, and on the cause of their unemployment (redundancy or other). To access their ISAs, workers who had open-ended contracts require a minimum of 12 contributions (consecutive or non-consecutive), while workers with fixed-

term contracts require at least 6 contributions.[22] On the other hand, workers can access the solidarity fund only if their ISA funds are not enough to cover their scheduled payment. In addition, they must have made at least 12 contributions during the last 24 months, with the last 3 being from the same employment relationship.

The payment scheme follows a staggered design, with ISA payments starting at 70% of the average income, followed by 55%, 45%, 40%, 35% and 30% from the sixth month until month thirteen. Solidarity fund payments vary depending on the type of contract: Open-ended contracts follow the same structure as with the ISA until month 5, while fixed-term contracts get 3 months of payments with a replacement rate of 50%, 40%, and 35%. In case of high unemployment,[23] each worker can get up to two additional payments with a replacement rate of 30% each.

Overall, take-up rates among the unemployed of the UISA are quite low as illustrated in Table 3. Given the low use of the UI system and, in particular, of the solidarity fund, the population of interest to our estimation is very small.[24] In our sample (2010-2018), we see that 20.3% of all terminated employment relationships make a request to the UI system, but only 4.8% satisfy the requirements for using the solidarity fund (11.7% of open-ended and 2.2% of fixed term contracts). Only half of the workers with the right to use it end up doing so (2.4% in total – 6.6% of open-ended and 0.8% of fixed-term workers). The effects we find, however, have to be put into context when extrapolating them to the labour market: *even if we find a longer unemployment period, we are talking about less than 5% of all terminated employment relationships among formal workers.*

Table 3 shows that the use of the UI is not only low, but highly regressive. Among open-ended contracts in the fifth quintile, 38% of all terminated relationships make a request to the UI, whereas only 16.7% of workers at the first quintile do so. This gap is even larger for fixed-term workers at 30% and 4.2% for the fifth and first quintile respectively. We also see large differences when looking at access and use of the solidarity fund. Among workers in the fifth quintile of the earnings distribution, 15.2% and 5.4% have the right to use the solidarity fund (open-ended and fixed term, respectively), and 7% and 2% use it. On the other hand, 4.2% and 0.2% of the first quintile of terminated workers have the right to use the solidarity fund, while usage rates are 2.8% and 0.1% for open-ended and fixed-term workers, respectively. Access and use of the solidarity component are thus highly skewed towards higher earning jobs, leaving the most vulnerable workers with lower incomes and who had fixed-term contracts (and are therefore more likely to become unemployed) wholly unprotected. Evidently, such a system exacerbates labour market inequalities rather than redressing them.

[22] In both cases, these contributions have to be accumulated since the last use that a worker made of the UI system. Workers can request funds from the UISA or SF only once every three years.

[23] Specifically, an unemployment rate one percentage point above the 4-year average.

[24] It must be noted here that there is no clarity as to why the take up level of the Chilean UISA system is so low. The Chilean Ministry of Labour once attempted to survey users of the system to find out more about take up rates, but the response rate to the survey was so low that its results were not published (Sehnbruch et al., 2019).

Table 3: Use of the UI by income quintile (% of all terminated employment relationships)

Open-ended contract						
Makes a request	1	2	3	4	5	Total
No	83.4%	70.7%	65.2%	61.9%	62.2%	68.7%
Yes	16.6%	29.3%	34.8%	38.1%	37.8%	31.3%
Right to FCS	1	2	3	4	5	Total
No	95.8%	90.9%	87.3%	82.8%	85.1%	88.4%
Yes	4.2%	9.1%	12.7%	17.2%	14.9%	11.7%
Uses FCS	1	2	3	4	5	Total
No	97.2%	94.4%	92.3%	90.0%	93.4%	93.4%
Yes	2.8%	5.6%	7.7%	10.0%	6.7%	6.6%
Fixed term contract						
Makes a request	1	2	3	4	5	Total
No	95.9%	90.9%	84.0%	78.2%	70.2%	83.8%
Yes	4.1%	9.2%	16.0%	21.8%	29.8%	16.2%
Right to FCS	1	2	3	4	5	Total
No	99.8%	99.2%	98.3%	96.9%	94.7%	97.8%
Yes	0.2%	0.8%	1.8%	3.1%	5.3%	2.2%
Uses FCS	1	2	3	4	5	Total
No	99.9%	99.7%	99.4%	98.8%	98.1%	99.2%
Yes	0.1%	0.3%	0.6%	1.2%	1.9%	0.8%

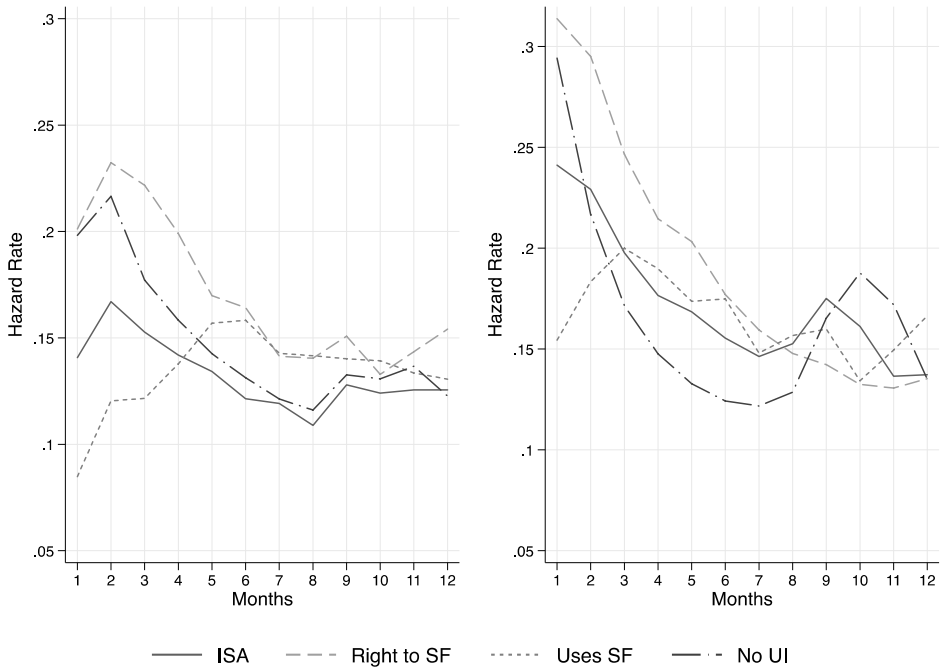
Source: Authors' own calculations using administrative data from the Chilean Unemployment insurance system. Quintiles are calculated separately for each group (i.e., open-ended, fixed term, total).

A simplistic approach to studying the effect of the solidarity fund would be to compare those who use it to those who do not. However, such a comparison would suffer from serious endogeneity issues due to selection bias. As Figure 1 shows, the hazard rate for unemployed workers varies significantly depending on how they use the system.[25] Workers who use the SF start their non-contribution period with particularly low hazard rates, while workers with the right to use the SF but choose not to use it have much higher hazard rates. The two tend to converge after benefits run out. The same can be said about workers who only use their ISAs or who do not use the UISA at all. These groups display different behaviours during

[25] The hazard rate is defined as the probability of ending the non-contribution period in time t, conditional on the fact that it has not finished by time t-1.

their non-contribution periods and comparing them directly would result in a biased analysis. The following section therefore presents our identification strategy.

Figure 1: Hazard rate by usage of the UI system



Source: Authors' own calculations using administrative data from the Chilean Unemployment insurance system.

4. Methodology and Empirical Framework

To account for the selection issue discussed in the previous section, a sharp regression discontinuity design is used. This exploits the fact that workers need at least 12 contributions in the last 24 months for them to have the right to request benefits from the solidarity fund. Using this cut-off, we compare workers' rights below and above this threshold to estimate the effect of having the right to access the solidarity fund. Under certain assumptions, the difference between these two groups will equal the effect of having the right to use the solidarity fund (Imbens & Lemieux, 2008; Lee & Lemieux, 2010).

Throughout the paper, we follow common practice in RDD by first examining the relevant discontinuities visually, and then proceeding to estimate standard regression discontinuity using the following model:

$$Y_i = \beta_0 + \beta_1 D_i + f(r_i, C_i) + e_i.$$

Where Y_i is the unemployment duration in months, D_i is an indicator variable equal to one if the worker has the right to use the solidarity fund, and $f(r_i, C_i)$ is a function of the running variable r_i, in this case the number of contributions in the last 24 months for the previous employment, and the eligibility rule C_i, whether the worker has 12 or more contributions (i.e.,

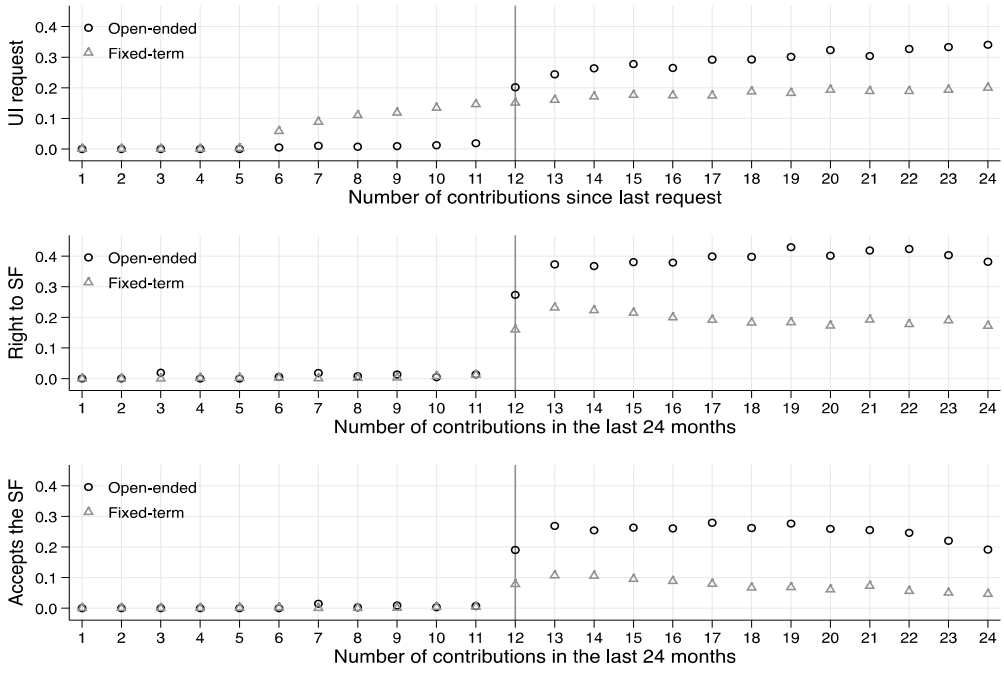
$C_i = 1(r_i \geq 12)$). For estimation, $f(r_i, C_i)$ is modelled as a linear function with different slopes on both sides of the slope. Bandwidth for estimation is set at 4 months. Different bandwidths were tested in the appendix, with results showing no important differences.

In this context, treated workers are the unemployed workers who have made at least 12 contributions in the last 24 months, and thus have the right to use the solidarity fund, while untreated workers are the unemployed workers with 11 or fewer contributions in the same period, and that do not have the right to use the solidarity fund.

We can see how this assignment rule works in Figure 2. The first graph shows the share of unemployed workers who make an UISA request relative to the number of contributions since their last request. In the case of fixed-term workers, requests can only be made after making six contributions to the UISA, while open-ended contract workers must contribute for at least 12 months before being able to claim benefits. Between 15 and 20% of unemployed fixed-term workers claim benefits from the UISA, while the figure increases to between 20 and 35% of the unemployed among open-ended contracts.

Graphs 2 and 3 in Figure 2 follow the rule used to access the solidarity fund: number of contributions in the last 24 months. Workers have the right to request the solidarity fund after 12 contributions, which is exactly the cut-off we see in the figure.

Figure 2: Take-up rates of the UISA and the solidarity fund (SF)



Note: Panel 1 includes the share of all terminated relationships that made a UI request as function of the number of contributions since the last request (i.e., the rule to access the UI). Panel 2 and 3 focus on the use of the solidarity fund, and therefore show shares of workers that made a request, as a function of the number of contributions in the last 24 months (i.e., the rule to access the SF). Panel 2 includes the share of workers with the right to use the SF and panel 3 the share of workers that accepts the SF. Contributions in the last 24 months do not necessarily have to have been continuous.

An alternative approach would be to estimate this model using a fuzzy RDD. We would be focusing on the compliers, that is, on those workers who have the right to use the solidarity fund and then decide to use it. If that were the case, our treatment would be 'using the SF' rather than 'having the right to use it'. The problem with such an approach lies in the extremely low take-up rates of the solidarity fund. As table 3 shows, only 2.4% of all terminated employment relationships result in the use of the SF, making the estimates from fuzzy RDD unreasonably large. For that reason, we opted for using only use sharp RDD in our analysis.

Our analysis centres on all terminated employment relationships after 2010 as the database is highly biased prior to this date: when the UISA system was implemented in 2002, all newly created employment relationships were automatically affiliated to the system, while workers with an active contract could opt in. This resulted in a database highly biased towards shorter employment relationships as only a negligible number of workers voluntarily joined the system. It is not until 2009 that the database matured and stabilized, producing estimates comparable to statistics derived from official employment surveys. In addition, a reform in 2009 changed the requirements needed to access the UI system. Focusing on the following year thus provides a sample of workers representative of the formal labour force, who all shared a common set of rules to access the UI. Our RDD analysis uses the same data set for all estimations. We look at all terminated relationships between January 2010 and January 2018.

The estimates stemming from the RDD will report the additional unemployment duration resulting from having the right to use the solidarity fund. Whether these estimates are beneficial or harmful depend on its cause. Long unemployment durations coming from moral hazard are completely different to those caused by a liquidity effect. To test the cause of this effect, we follow Chetty (2008) and compare high-earning workers to those with low earnings who are therefore more likely to be liquidity constrained. The comparison between the two will give us an indication of the relative importance of the two causes, as low income workers are expected to suffer both from moral hazard and liquidity effects, while high income workers will only suffer from the former.

5. Results

In this section we discuss the effect of having the right to use the solidarity fund, by type of contract as well as for the total sample. We start by showing our results graphically and proceed to show the regression tables. All graphs include the confidence interval at 95%. Lastly, and in order to study the relative importance of the moral hazard and liquidity effects, we proceed to repeat the analysis for each quintile of the earnings distribution. Table 4 summarizes all results in regression form.

We look at workers close to the threshold for the right to use the solidarity fund, and compare those who are right below with those who are right above the threshold. Because our treatment is the right to use the solidarity fund rather than its actual use, we interpret these results as the lower bound of the effect of actually using it.

Before discussing our RDD results, it is important to put these in context. As discussed before, only 31.5% of workers who had open-ended contracts and became unemployed end up making a request to the UISA system, while 16.2% of fixed-term contracts do so. 11.8% of open-ended contracts and 2.3% of fixed-term contracts had a job that lasted long enough for them to be able to access the solidarity fund. The requirements to use the solidarity fund thus end up being highly demanding, as they allow only a very small proportion of workers to use it. It is only because we are using a very large sample of administrative data that it is possible for our analysis to focus on such a small group of workers and still produce statistically meaningful and accurate results.

Table 4 below analyses *all terminated employment relationships* that contributed to the UI system between 2010 and 2018 as only these workers would have the right to claim insurance benefits, and these are the workers who constitute the sample for our subsequent RDD. However, as our initial RDD results showed that there was no moral hazard effect, we dug deeper into the data and examined the behaviour of first-time entrants into the system. Our RDD thus makes a distinction between established workers and first-time entrants. The latter are defined as first-time contributors to the system and (if they make a request) can be first-time users of the UI system. This does not necessarily mean that we are looking at a worker's first job. As the UI only includes formal wage-earners from the private sector, entrants could include former public workers, self-employed or domestic service workers, employees, who had stable jobs and are only just entering the system for the first time or even former employers.

As Table 4 shows, the employment conditions of first-time entrants are slightly more precarious than those of established workers in that they hold a higher proportion of fixed-term contracts. However, entrants with open-ended contracts earn higher incomes than established workers and the duration of their contribution to the system is significantly longer. This suggests that entrants with open-ended contracts include workers with previous employment experience, who only became part of the UI system when they changed jobs. On the other hand, entrants with fixed-term contracts are younger, have significantly shorter job durations, and have lower incomes, more in line with what one would expect from first-time jobs.

Table 4: Descriptive statistics of all terminated employment relationships, 2010 - 2018

	All workers (100%)		**First time entrants (9.1%)**		**Established workers (90.9%)**	
	Open-ended (27.9%)	Fixed-term (72.1%)	Open-ended (20.8%)	Fixed-term (79.2%)	Open-ended (27.3%)	Fixed-term (72.7%)
Income (USD)	617.1	381.3	755.0	301.8	606.9	390.0
Age	35.5	32.9	37.3	25.1	35.3	33.7
Gender (male)	75.3%	79.8%	73.4%	70.2%	75.4%	80.8%

Duration (contribution)	18.2	12.1	14.4	3.2	18.4	13.0
Duration (< 3 months)	25.9%	69.1%	18.6%	75.5%	26.4%	68.4%
Duration (Non - contribution)	6.1	5.2	7.5	7.5	6.0	4.9
Observations	344,643	889,442	25,698	97,869	370,341	987,311

Source: Authors'own calculations using administrative data from the Chilean Unemployment insurance system. January 2018 exchange rate (602.3 CLP).

Before discussing our results, Table 5 compares workers right below the cutoff of 12 months with those right above it. This comparison serves as a cross check for our RDD (a similar result is shown in figures A1 to A4 in the appendix). Workers above the cutoff have slightly higher income (which, as shown in Figure A, can be explained by the upwards trend for income). The remaining variables show very small differences between both groups.

Table 5: Descriptive statistics below and above the cutoff

	Below the cutoff			Above the cutoff		
	Open-ended	Fixed-term	Total	Open-ended	Fixed-term	Total
	26.5%	73.5%	100%	32.2%	67.8%	100%
Income (USD)	610.9	322.7	399.1	645.4	336.5	436.0
Age	36.1	31.1	32.4	36.3	31.4	33.0
Gender (male)	0.8	0.7	0.7	0.7	0.8	0.8
Duration (contribution)	17.5	7.8	10.4	17.6	8.7	11.6
Duration (< 3 months)	26.6%	81.8%	67.2%	24.2%	74.8%	58.5%
Duration (Non - contribution)	10.5	10.4	10.4	12.5	12.5	12.5
Observations	19,803	54,869	74,672	14,305	30,084	44,389

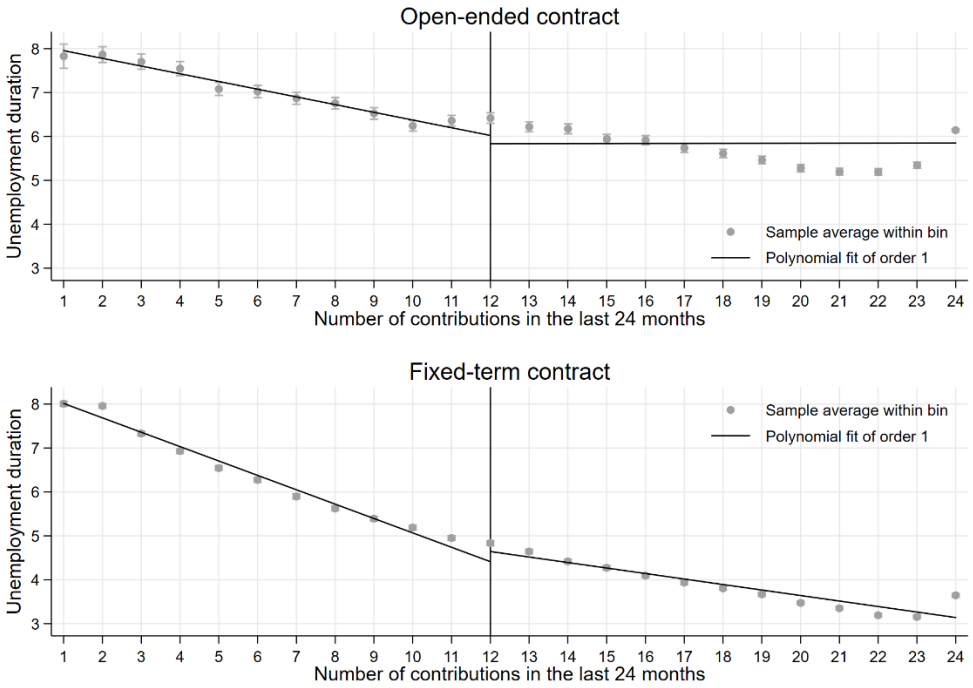
Source: Authors' own calculations using administrative data from the Chilean Unemployment insurance system. We include all workers with unemployment duration of 10 and 11 months (below the cutoff) and 12 and 13 (above the cutoff). January 2018 exchange rate (602.3 CLP).

5.1. Average effect of having the right to use the solidarity fund

Figure 3 shows the duration of unemployment versus our running variable, the number of contributions in the last 24 months for all terminated employment relationships. The first panel shows how workers who had open-ended contracts use the UI system, while the second panel illustrates how workers who had fixed-term contracts use it. We find small to no effects

among the overall sample, as shown graphically in Figure 3 as well as in Table 6, which shows a small difference, of 0.13 months (4 days) for fixed-term workers and 0.18 months (5.4 days) for open-ended workers. Effects, although statistically significant, are small in terms of their economic significance.

Figure 3: Duration of unemployment by number of contributions in the last 24 months



Overall, we must therefore conclude that the evidence of moral hazard in the Chilean UISA is negligible, especially considering that, as discussed above, only 4.9% of the workers in our sample satisfy the requirements make a claim for benefits from the solidarity fund. However, as we are working with a large sample of administrative data, we are nevertheless able to dig deeper into the data while maintaining the precision of our estimates. We can therefore examine whether this conclusion holds for all workers in the system, or whether there are exceptions to this rule. To this end, we examine a particular subgroup of our sample: the first-time entrants to the UISA system, i.e. workers who appear in our database for the first time, as defined above.

As Figure 4 shows, when we look at entrants, we see larger differences in how entrants and non-entrants use the UISA. Table 6 shows that these effects are equivalent to 1.7 months (51 days) for open-ended contracts, and of 1.4 months (42.7 days) for fixed-term contracts. The average effect for entrants is of 1.56 months, or 46.8 days. First-time entrants show a significantly higher effect of having the right to use the solidarity fund, but as Figure 2 shows, these effects diminish importantly once we consider the following employment relationships.

Figure 4: Duration of unemployment by number of contributions in the last 24 months (entrants only)

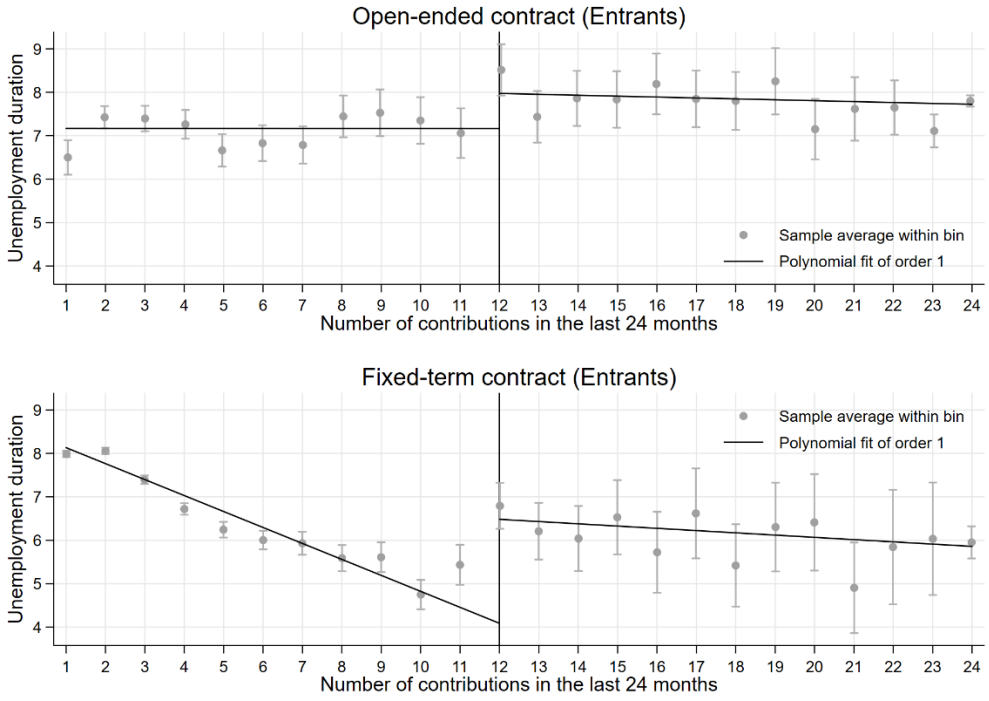


Table 6: Effect of having a claim to the solidarity fund

	All Contracts			Open ended			Fixed term		
	All workers	Entrants	Non-entrants	All workers	Entrants	Non-entrants	All workers	Entrants	Non-entrants
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RD Estimate	0.107**	1.497***	0.0712	0.122	1.468***	0.0296	0.103**	1.487***	0.0823*
	(0.0442)	(0.333)	(0.0444)	(0.111)	(0.521)	(0.114)	(0.0472)	(0.428)	(0.0474)
Obs.	1,357,652	123,567	1,234,085	370,341	25,698	344,643	987,311	97,869	889,442

Standard errors in parentheses. All regressions use 4 months for bandwidth.

*** p<0.01, ** p<0.05, * p<0.1

Although these effects are important in terms of unemployment duration, the reference group is so small as to make the overall impact on the UI system almost negligible. First-time users of the UI system represent less than 10% of the overall sample, and those among them who contribute for the required 12 months represent 14.2% of these workers, i.e. no more than 1.4% of the workers, who become unemployed and use the UI system.[26] It is within this small group that we find some effects. Given that these are lower bounds of the effect of using the

[26] 55.8% of open-ended contracts and 3.5% of fixed term contracts.

solidarity fund, the fact that only around half of the workers with the right to use it end up doing so suggests that a large aggregate effect is unlikely.

The fact that the quality of employment for entrants differs by type of contract suggests that these effects stem from different sources. Open-ended contracts are often associated with better employment conditions in general, while fixed-term contracts have worse than average employment conditions. By using wages as a proxy of net assets, and therefore of liquidity constraints, we expect the liquidity effect to matter more for entrants with fixed-term contracts than for entrants with open-ended contracts. The following section develops this idea by studying the effects at the extremes of the wage distribution.

5.2. Heterogeneous effects: Effects by average wage quintile.

The degree of liquidity constraint can be measured using household net assets (Chetty, 2008), as households with no (or negative) net assets will have little liquidity to respond to unemployment shocks. Unfortunately, the Chilean UI database includes no information on savings, wealth, or debt. To provide a measure of the extent of liquidity constrains of each worker, we follow Centeno and Novo (2009) and split the sample into income quintiles for each type of contract.[27] This idea follows from the evidence that wages are the main driver of differences between poor and rich households and a good proxy of net assets (Ziliak, 2003). Indeed, incipient studies show how wealth in Chile is highly concentrated at the top, with the bottom 60% holding almost no wealth at all (Sanroman & Santos, 2017). By comparing workers in the lower and higher earnings quintiles, we expect to compare households with different wealth levels. Households with limited (or no) wealth are expected to experience both a liquidity and a moral hazard effect, while high wealth households should only experience the latter (Chetty, 2008; Chetty & Looney, 2006).

Table 7 extends the descriptive statistics of Table 5 by splitting the sample into wage quintiles. By construction, wages for the fifth quintile are higher, but the gaps are large. Average wages for the highest quintile are roughly 10 times larger than for the first quintile. The fifth quintile is also comprised by older workers (gaps of 5 to 10 years), by a higher share of men (14 to 20 percentage points) and a higher share of workers with higher education (3 to 20 percentage points higher). The fact that entrants with open-ended contracts have better jobs than non-entrants holds across all quintiles, as is the case for fixed-term entrants, with lower incomes than non-entrants for all quintiles.

[27] The authors use income quartiles, but given the large number of observations, we divide the sample into quintiles, thus providing a slightly finer decomposition of the liquidity constraint distribution.

Table 7: Descriptive statistics by entrant status, type of contract, and by quintile

			Income (USD)	Age	Gender (% men)	Duration (contribution)	Duration (< 3 months)	Duration (Non-contribution)
Non-entrants	Open ended	Q1	171.0	33.6	54.7%	14.7	53.4%	6.9
		Q2	311.1	34.6	59.6%	17.4	27.8%	6.4
		Q3	415.3	34.7	61.2%	18.7	21.3%	6.5
		Q4	612.8	35.4	67.7%	20.2	16.2%	6.3
		Q5	1524.3	38.4	73.5%	21.2	13.5%	6.7
	Fixed term	Q1	78.6	31.8	60.8%	10.5	94.8%	5.7
		Q2	197.4	32.7	62.6%	11.4	81.4%	5.5
		Q3	302.8	33.5	65.9%	12.8	64.8%	5.1
		Q4	431.7	34.1	68.1%	13.9	56.8%	5.1
		Q5	939.7	36.6	80.6%	16.5	44.2%	4.4
Entrants	Open ended	Q1	181.5	33.2	50.3%	10.1	38.8%	8.3
		Q2	317.4	35.7	54.4%	13.2	21.6%	7.9
		Q3	422.7	35.4	56.0%	13.5	15.8%	8.7
		Q4	687.1	38.7	60.0%	16.6	10.6%	8.5
		Q5	2167.3	43.3	67.7%	18.8	6.2%	9.7
	Fixed term	Q1	66.5	23.2	44.2%	1.6	96.1%	8.8
		Q2	162.9	24.0	44.1%	2.5	85.7%	8.5
		Q3	250.7	24.9	48.2%	3.2	75.5%	7.9
		Q4	353.4	25.4	51.9%	3.9	65.8%	7.6
		Q5	676.2	28.0	58.2%	4.9	54.2%	7.6
All workers	Open ended	Q1	172.3	33.6	54.3%	14.3	52.3%	7.0
		Q2	311.5	34.7	59.2%	17.1	27.1%	6.6
		Q3	416.0	34.7	60.9%	18.4	21.2%	6.6
		Q4	616.1	35.5	67.3%	20.0	16.0%	6.4
		Q5	1569.8	38.7	73.0%	21.0	12.9%	6.9
	Fixed term	Q1	77.1	30.8	58.8%	9.4	94.9%	6.1
		Q2	193.2	31.5	60.3%	10.3	82.2%	5.9
		Q3	297.0	32.6	64.1%	11.8	66.0%	5.4
		Q4	423.4	33.3	66.7%	12.9	57.7%	5.3
		Q5	915.8	36.1	79.1%	15.9	44.9%	4.6

Source: Authors'own calculations using administrative data from the Chilean Unemployment insurance system. January 2018 exchange rate (602.3 CLP).

Table 8 estimates the effect of having the right to use the solidarity fund separately across earning groups. We look at the separate effect for quintiles 1 and 2 (bottom 40%), quintiles 3 and 4, and quintile 5 (top 20%). We see that general results hold. Effects for entrants are much larger than effects for the complete sample. However, we see that the effects for entrants are driven by the extremes of the distribution, with only the extremes of the distribution showing statistically significant effects.

As discussed above, we expect lower income quintiles to be more liquidity constrained than top quintiles. If moral hazard effects are homogeneous across the wage distribution, then lower quintiles having a higher effect would indicate the presence of a liquidity effect. When looking at entrants with open-ended contracts, the top 20% increases their noncontribution period in 3.4 months, compared with an increase of 1.7 for the bottom 40%. On the other hand, entrants with fixed-term contracts show effects at the bottom of the distribution that are larger than effects at the top: 2.81 additional months versus 2.46 months. Results therefore suggest the presence of a liquidity effect *only among entrants with fixed-term contracts.*

Table 8: Effect of having the right to use the solidarity fund by average income quintile

All Workers						
	Open ended			**Fixed term**		
	Bottom 40%	40 to 80%	Top 20%	Bottom 40%	40 to 80%	Top 20%
RD	-0.000816	0.238	0.453	0.0104	0.140*	0.226*
	(0.149)	(0.185)	(0.386)	(0.0719)	(0.0735)	(0.120)
Obs.	148,158	148,115	74,068	395,248	394,616	197,447
Entrants						
	Open ended			**Fixed term**		
	Bottom 40%	40 to 80%	Top 20%	Bottom 40%	40 to 80%	Top 20%
RD	1.707**	0.596	3.412**	2.813*	0.0352	2.455***
	(0.827)	(0.754)	(1.458)	(1.437)	(0.645)	(0.623)
Obs.	10,307	10,252	5,139	39,157	39,147	19,565
Non-entrants						
	Open ended			**Fixed term**		
	Bottom 40%	40 to 80%	Top 20%	Bottom 40%	40 to 80%	Top 20%
RD	-0.0770	0.234	-0.0211	0.00664	0.105	0.221*
	(0.151)	(0.191)	(0.399)	(0.0710)	(0.0743)	(0.124)
Obs.	137,960	137,755	68,928	355,778	355,826	177,838

Standard errors in parentheses

** p<0.01, ** p<0.05, * p<0.1

This result supports the idea that the liquidity effect is relatively more important for fixed-term workers. Given a relatively higher wealth stock, workers in the fifth quintile are expected to experience very little liquidity constraints, and therefore their effect is (at least to a great extent) driven by a moral hazard effect. Adapting Chetty (2008), the difference between this effect and the effect for the bottom 40% can be interpreted as being driven by a liquidity effect. The fact that it is the most precarious jobs that have the strongest effect points to the fact that the liquidity effect trumps the moral hazard effect in that group.

When looking at open-ended contracts, the opposite result holds. Entrants have better jobs than the average open-ended worker, and among entrants the strongest effect appears to be among workers with the highest wages. As the largest effect is at the top of the distribution, the moral hazard effect appears to matter more than (or at least as much as) the liquidity effect in this group. However, it is important to remember that these results can only be observed among 2.9% of the total number of unemployed workers, which corresponds to unemployed first-time entrants with fixed-terms contracts, who fall into the bottom 40% of their earnings distribution.

6. Conclusions

In the introduction, we asked how unemployed workers in developing countries can be protected by unemployment insurance in the broader context of social protection systems. Based on this question, this paper first analysed the Chilean UI system using administrative data to show that its coverage is extremely low in terms of the workers who become unemployed and subsequently claim benefits from the system (Table1 and 3). Only 11.8 percent of workers who had open-ended contracts and became unemployed had the right to make a claim from the insurance system's solidarity fund. Of these workers, only 6.7 percent actually made a claim. Among the most precarious workers, i.e. those with fixed-term contracts, this proportion drops to 2.3 percent and 0.9 percent respectively.

As discussed in the introduction to this paper, this limited coverage is due to the high level of job rotation in the Chilean labour market rather than to overly stringent conditions embedded in the insurance system that require workers to contribute to the insurance for a particular length of time before being able to come claim benefits.

Second, among the unemployed who do receive benefits, *we observe no moral hazard* in the use of these benefits overall: neither among workers with open-ended or fixed term contracts, nor among workers who have access to the solidarity fund. This contradicts findings from previous studies (Huneeus et al., 2012; Reyes-Hartley et al., 2011), which is possibly because the latter used a period of data during which the unemployment insurance system was not yet mature. Using an RDD, we found some degree of moral hazard, but only by digging deeper into the data and isolating first-time users (entrants) of the insurance system with fixed-term contracts. For this group, having the right to use the solidarity fund can increase unemployment durations by 1.56 months on average. However, by this time we are looking at such a small proportion of the unemployed that our overall conclusion is not only that the moral hazard effect of this system is minimal, but that it also affects only 2.9% of our sample, so as to be negligible overall.

Third, to explore the relative importance of the liquidity and moral hazard effects in our results, we estimate our results by wage quintile, which was not done by previous studies. Unfortunately, the low coverage of the system means that it provides very little liquidity to unemployed workers in general. Our results show that average effects are driven by the bottom 40% and the fifth quintile, with little to no changes in the middle of the wage distribution. However, the effect size changes by type of contract. Open-ended entrants show a larger effect among high wage-earners (3.3 versus 2.97 additional months), while fixed-term workers show a much larger effect among low wage-earners (6.5 versus 2.4 months). We suggest that these results point towards a higher relative importance of the liquidity effect for fixed-term workers.

Fourth, this paper makes the more general point that while, theoretically, it could be argued that the design of the unemployment insurance system fulfilled its purpose by avoiding moral hazard, it seems more relevant to argue that the system overall is not working because it does not protect the unemployed, i.e. the cost of avoiding moral hazard comes at the cost of providing such minimal benefits that the unemployed are discouraged from claiming benefits. Experts and policymakers recommending that a system similar to the Chilean model be replicated in other developing countries should be aware of these limitations.

In particular, it must be highlighted that the Chilean UI system exacerbates prevailing inequalities in the labour market: first of all, the likelihood that workers with precarious jobs become unemployed is much higher than the probability of workers with stable jobs and higher incomes becoming unemployed. Second, among the unemployed the most precarious workers are the least protected, while workers who had relatively good jobs are more likely to be able to claim benefits from the system. Finally, the solidarity fund embedded in the system, which is was originally supposed to redistribute funds towards lower income workers, does exactly the opposite. Workers in low quality jobs in Chile therefore face a double inequality: On the one hand, they are more likely to become unemployed, and on the other, if they become unemployed, they are less likely to receive benefits.

In addition, the Chilean UI does not include any provisions for redistribution linked to the situation of individual workers. Unlike UI systems in developed countries, which pay out higher replacement rates depending on wage levels, how many children or dependents a worker has, whether s/he is the main earner in the family or the worker's age (Schmieder, von Wachter and Bender, 2012), the Chilean system includes no such mechanism.

This paper contributes to the existing literature in several ways; first, it shows that a theoretical concern about moral hazard and optimal insurance design in the theoretical literature developed in a context of industrialised countries with formal labour markets may play out very differently in developing countries. Second, the liquidity analysis undertaken in this paper shows that this aspect must be considered when designing insurance systems in developing countries. Third, this paper contributes to the empirical literature on how unemployment insurance systems function in developing countries, and therefore hopes to inform theoretical discussions, which at the moment are rarely driven by empirical results. In particular, its use of administrative data allows us to undertake a much more nuanced analysis of how the Chilean UI is functioning in practice. Further research, however, is also required to study the effects of unemployment on the reemployment wages of workers in Chile.

Overall, our paper leads to the conclusion that optimal UI systems can be designed that look good in theory but then fail to cover the unemployed as the conditions they impose on potential beneficiaries are not compatible with employment conditions in precarious labour markets (Robalino, 2014; Sehnbruch et al., 2019). The consensus that can be distilled from the existing literature, which recommends UI systems for developing countries based on individual savings accounts combined with a solidarity component, end up significantly curtailing the role of UI as a social policy as well as its potential to address liquidity constraints and inequalities resulting from loss of employment.

In our view, there also remains a strong role for other forms of social protection that have traditionally been used at times of economic crisis or to protect the most vulnerable in developing countries. Whether these guarantee income (e.g. conditional cash transfer programmes, earned income tax credits or universal basic incomes) or employment (emergency employment programmes or employment guarantees) would depend on local contexts.[28] Most importantly, however, such policies must take into account the particularities of individual countries and consider that theoretical incentives built into an insurance system that looks optimal on paper may not be enough to countervail the limitations arising from structural characteristics of local labour markets.

[28] See Ravallion (2019) for a discussion of the relative advantages and disadvantages of income versus employment guarantees.

Appendix

Robustness checks

To check the robustness of these results, we study a series of specification tests to verify if the core assumptions of the RDD hold (Imbens & Lemieux, 2008). All results are estimated for the entrants' subsample.

1. Looking for possible jumps in the value of other covariates at the cutoff.

The assignment rule should have an impact on other variables, as they are not affected by the treatment. We test this hypothesis for four different variables: average income, age, having complete high school, and living in the Metropolitan Region of Chile. All results are estimated separately by type of contract and are shown in figures A1 to A4.

Figure A1: RDD for average income.

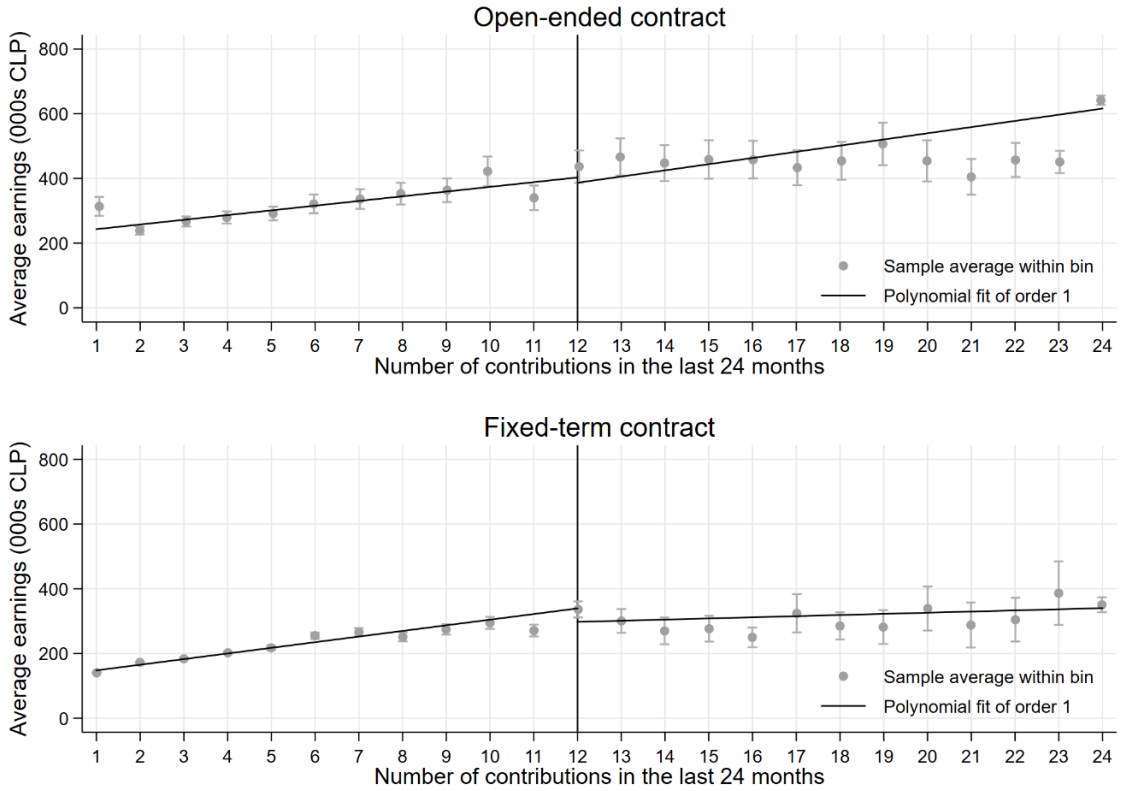


Figure A2: RDD for age.

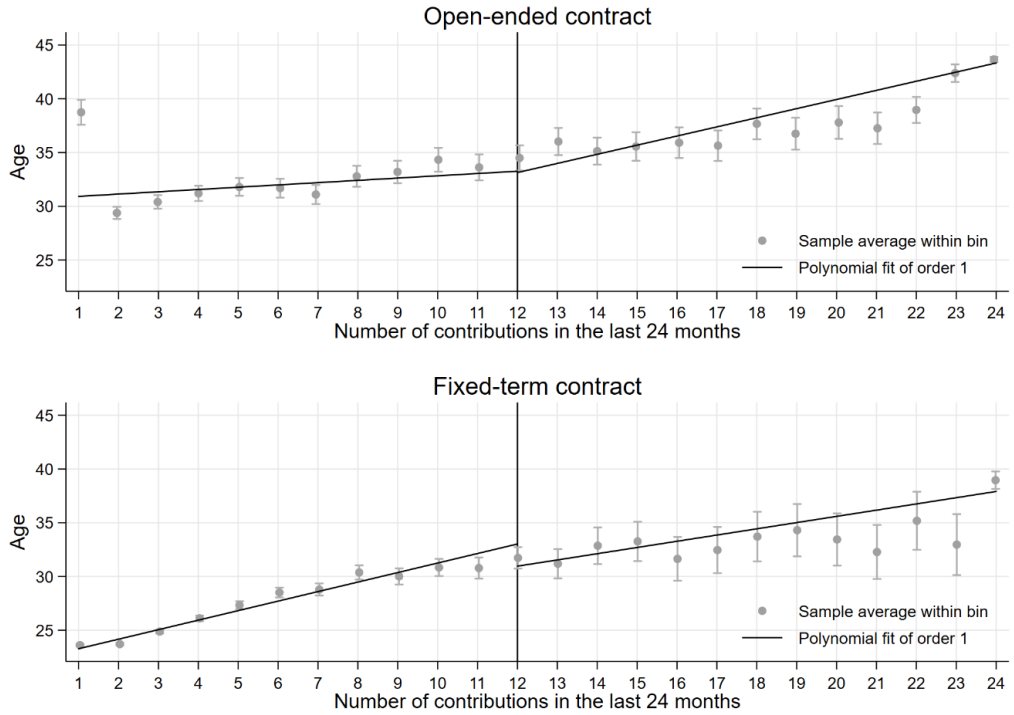


Figure A3: RDD for having competed high school.

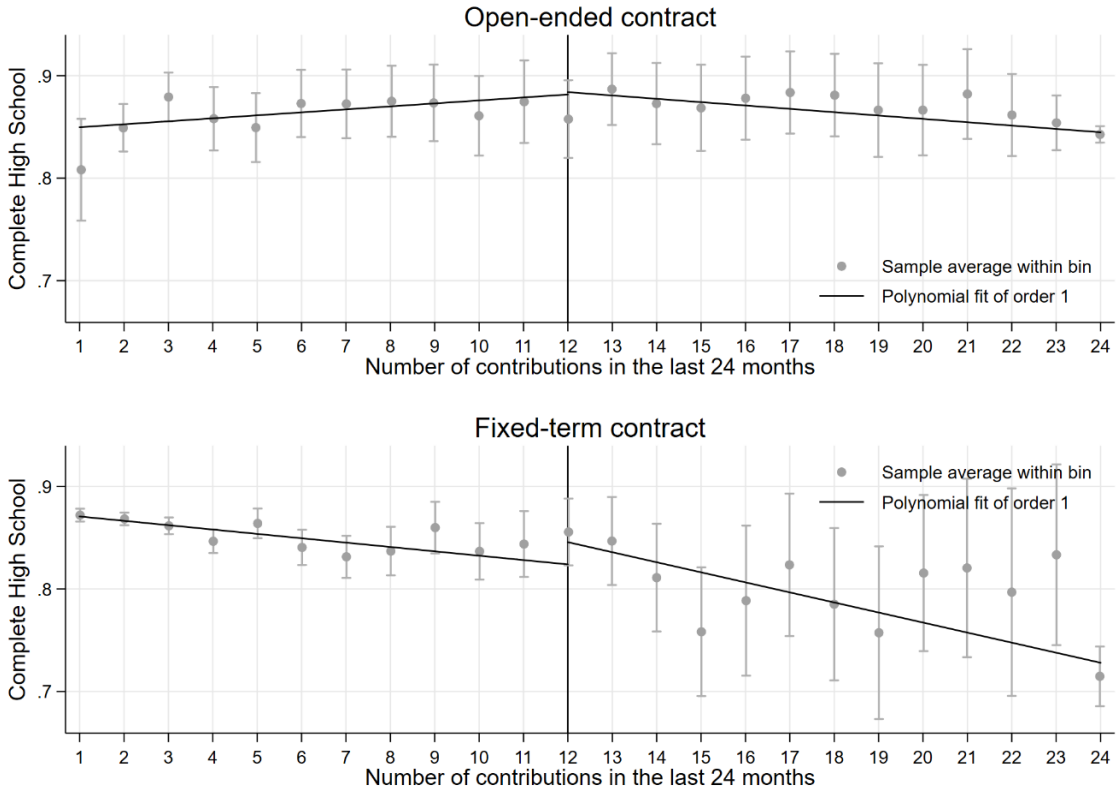
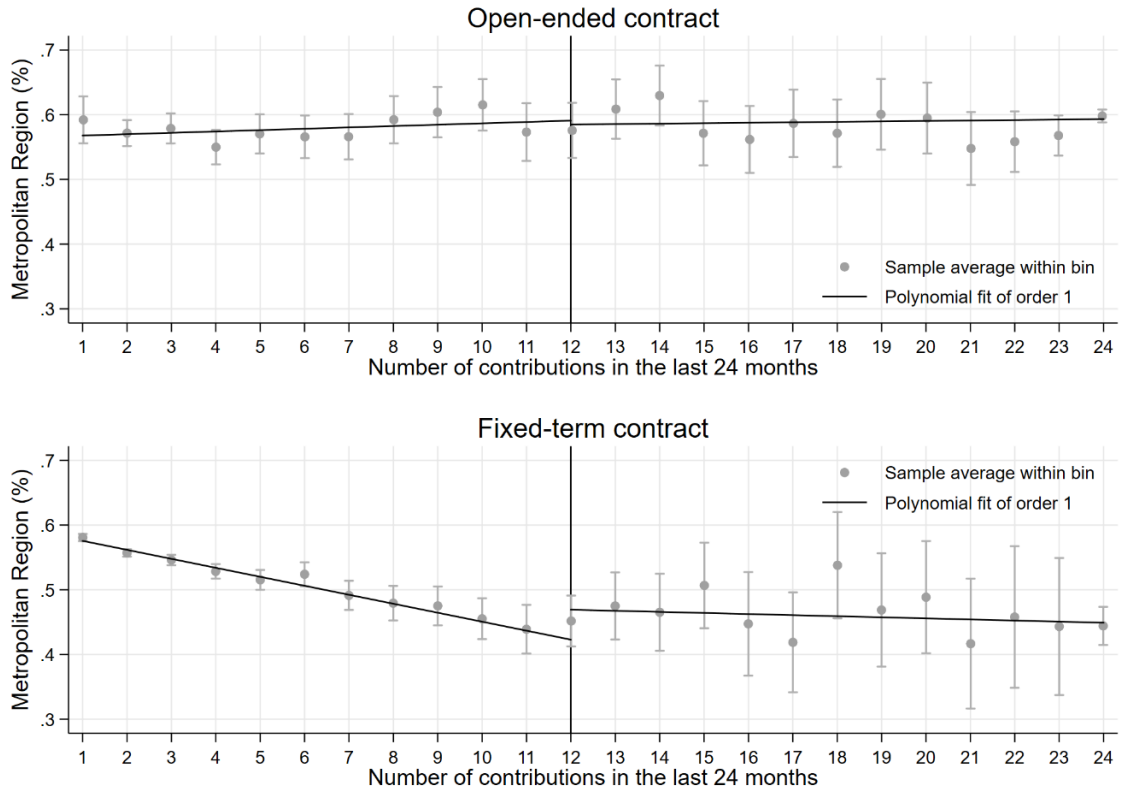


Figure A4: RDD for living in the Metropolitan region



Figures A1 to A4 show no discontinuities at the cutoff point. Slight differences can be seen for income and age, however these differences are not statistically significant.

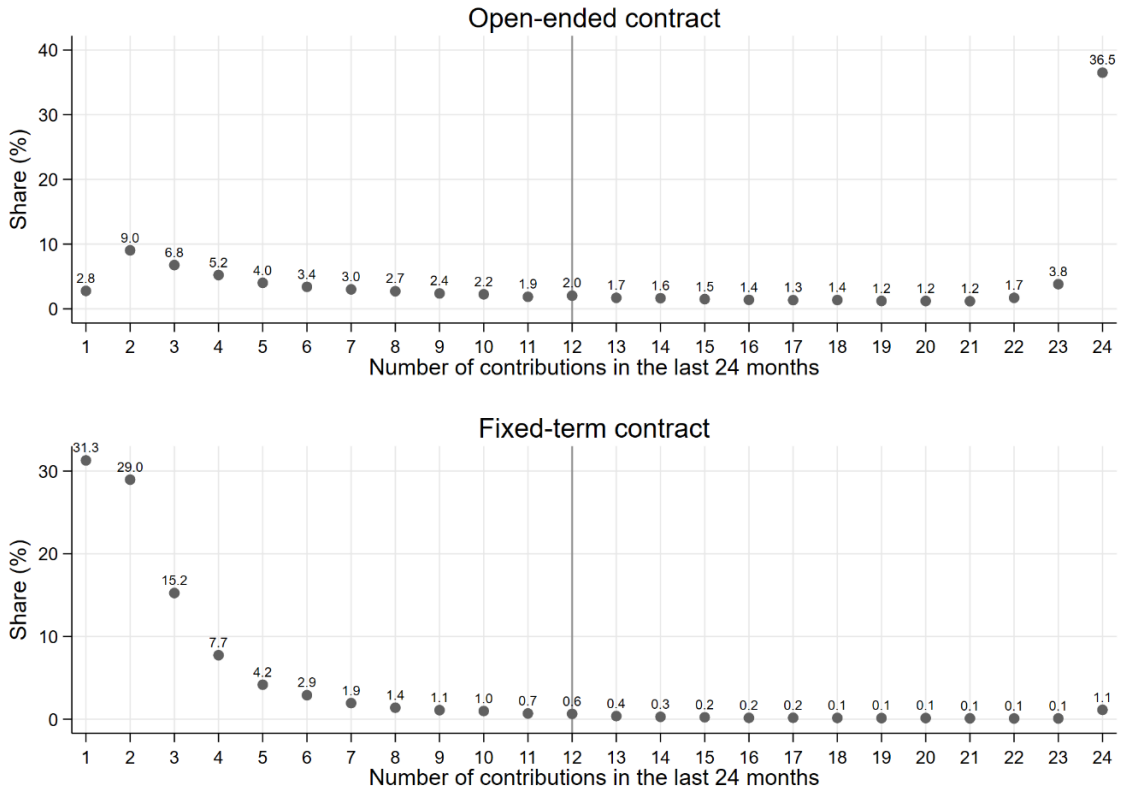
2. Testing for possible discontinuities in the conditional density of the forcing variable.

RDD can suffer from strategic behaviour if individuals are able to manipulate the forcing variable. In this case, strategic behaviour would arise if workers deliberately waited to have 12 contributions before losing their jobs in order to have the right to use the solidarity fund. This would show as an unusually low share of workers with 11 months of employment, as all of them would wait one additional month. If that were the case, our analysis would be violating the non-discontinuity assumption.

In order to test this, we plot the conditional density of the duration of the previous employment, which is shown in figure

Visual inspection of figure A5 shows that the conditional density for employment duration if fairly continuous. There appears to be a small jump right after the 12 months cutoff. However, this jump is small (0.4 percentage points in both cases), and it is not unique to that particular point.

Figure A5: Conditional density of the duration of employment.



3. Looking for discontinuities at other values of the forcing variable

The RDD assumes that there are no other jumps over the distribution of the forcing variable. In other words, there should be a zero effect where we expect the effect to be zero. Imbens and Lemieux (2008) suggests checking the median point at both sides of the cutoff, however, the median at the left is of 2 months, which leaves no space to test for discontinuities at the left. We estimate this test only for fixed term contracts, as here is where we find an effect. Figure A6 shows the results for cutoffs at 6 and 18 months.

Figure A6: Test for discontinuities at other cutoff points.

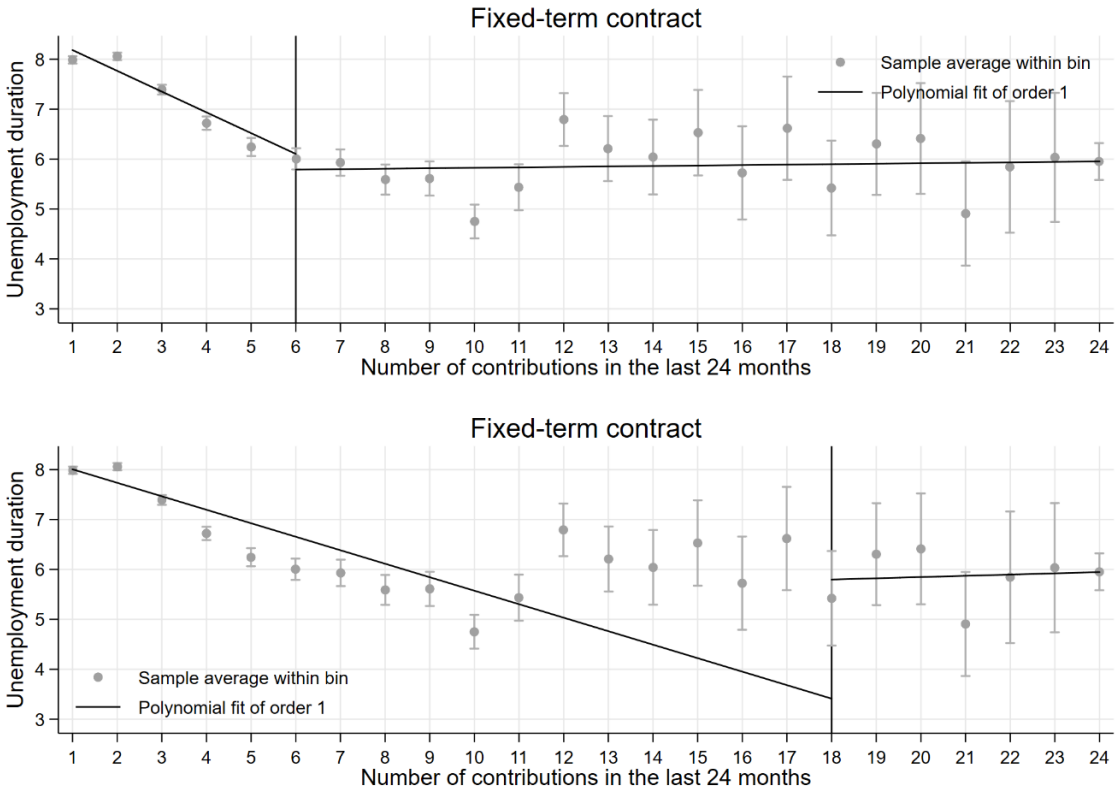


Figure A6 shows no discontinuity at either of the two points. There appears to be a discontinuity at the 18-month cutoff, but that is only because the linear approximation to the left of the cutoff is an average between the trends pre- and post-12 months. If we look at the confidence intervals of the points around the 18-month cutoff, we see no statistically significant difference before and after the cutoff.

4. Using different specifications: different bandwidths, including covariates, and clustering the standard errors.

Lastly, we explore different specifications of the original estimations. First, we explore the use of different bandwidths used to construct the polynomial fits under the Epanechnikov kernel. We estimate the effect of having the right to access the solidarity fund for fixed term workers under two different choices of MSE-optimal bandwidth: one using the difference of regression estimates (the default) and one using the sum of the regression estimates. For both cases, we estimate the effects multiplying the bandwidth by a different factor, from 0.8 to 2. Results, shown in table A1, show that effects remain statistically significant, although they do increase in size when the bandwidth increases.

Table A1: Treatment under different bandwidths and kernels (Entrants)

Triangular Kernel (Default)									
		BW x 0.8			BW x 1			BW x 1.25	
	All	Open ended	Fixed term	All	Open ended	Fixed term	All	Open ended	Fixed term
RD_Estimate	1.320***	1.547***	1.169**	1.497***	1.468***	1.487***	1.530***	1.250***	1.675***
	(0.366)	(0.574)	(0.470)	(0.333)	(0.521)	(0.428)	(0.279)	(0.436)	(0.361)
Observations	123,567	25,698	97,869	123,567	25,698	97,869	123,567	25,698	97,869
		BW x 1.5			BW x 1.75			BW x 2	
	All	Open ended	Fixed term	All	Open ended	Fixed term	All	Open ended	Fixed term
RD_Estimate	1.472***	0.946**	1.760***	1.427***	0.773**	1.776***	1.403***	0.643**	1.773***
	(0.246)	(0.385)	(0.319)	(0.222)	(0.349)	(0.291)	(0.205)	(0.322)	(0.270)
Observations	123,567	25,698	97,869	123,567	25,698	97,869	123,567	25,698	97,869
Epanechnikov Kernel									
		BW x 0.8			BW x 1			BW x 1.25	
	All	Open ended	Fixed term	All	Open ended	Fixed term	All	Open ended	Fixed term
RD Estimate	1.343***	1.483***	1.247***	1.517***	1.405***	1.555***	1.521***	1.161***	1.714***
	(0.354)	(0.555)	(0.455)	(0.326)	(0.512)	(0.419)	(0.271)	(0.425)	(0.351)
Observations	123,567	25,698	97,869	123,567	25,698	97,869	123,567	25,698	97,869
		BW x 1.5			BW x 1.75			BW x 2	
	All	Open ended	Fixed term	All	Open ended	Fixed term	All	Open ended	Fixed term
RD Estimate	1.441***	0.826**	1.777***	1.395***	0.663*	1.780***	1.373***	0.540*	1.766***
	(0.238)	(0.374)	(0.310)	(0.216)	(0.339)	(0.282)	(0.199)	(0.313)	(0.263)
Observations	123,567	25,698	97,869	123,567	25,698	97,869	123,567	25,698	97,869

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A second difference in specification is the inclusion of covariates (Table A2). We estimate the effect including gender and schooling dummies, as well as the average income in the previous employment period. Results show that effect sizes go down, but remain significant in the conventional approach, but not in the bias-correct effect under robust standard errors.

Table A2: Effects including covariates

	All	Open ended	Fixed term
	(1)	(2)	(3)
RD estimate	1.258***	1.521***	1.127***
	(0.314)	(0.482)	(0.411)
Observations	123,567	25,698	97,869

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A2: Effects including covariates

	All	Open ended	Fixed term
	(1)	(2)	(3)
RD estimate	1.258***	1.521***	1.127***
	(0.314)	(0.482)	(0.411)
Observations	123,567	25,698	97,869

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The third difference in specification is to cluster the standard errors, thus allowing within-cluster variance (table A3). We use three variables to cluster: the economic sector of the worker, the district (*comuna*) where the worker lives, and the cohort in which the work was born. Effects remain significant in all cases, although the effects under economic sector and birth cohort clusters show are statistically significant at a lower level.

Table A3: Estimation with clustered standard errors.

	Cluster: Economic sector			Cluster: District			Cluster: Birth cohort		
	All	Open ended	Fixed term	All	Open ended	Fixed term	All	Open ended	Fixed term
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RD estimate	1.497***	1.468***	1.487***	1.497***	1.468***	1.487***	1.497***	1.468**	1.487***
	(0.385)	(0.497)	(0.519)	(0.455)	(0.486)	(0.501)	(0.491)	(0.606)	(0.527)
Observations	123,567	25,698	97,869	123,567	25,698	97,869	123,567	25,698	97,869

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A3: Estimation with clustered standard errors.

		Cluster: Economic sector			Cluster: District			Cluster: Birth cohort	
	All	Open ended	Fixed term	All	Open ended	Fixed term	All	Open ended	Fixed term
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RD estimate	1.497***	1.468***	1.487***	1.497***	1.468***	1.487***	1.497***	1.468**	1.487***
	(0.385)	(0.497)	(0.519)	(0.455)	(0.486)	(0.501)	(0.491)	(0.606)	(0.527)
Observations	123,567	25,698	97,869	123,567	25,698	97,869	123,567	25,698	97,869

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The role of informal employment during noncontribution periods

We have no information on workers after their employment relationships end. This means that they could be working (informally, as formal self-employed, or in the public sector) during the noncontribution period, thus artificially increasing the duration of the period between formal private jobs. To address this issue, we re-estimate our main results with a subsample with shorter noncontribution duration periods. We look at workers with a noncontribution duration of at most 12, 6, and 3 months. Results are shown in table A4.

Table A4: Effect of having a claim to the solidarity fund (for shorter nonemployment duration subsample)

Maximum 12 months of noncontribution duration

	All Contracts			Open ended			Fixed term		
	All workers	Entrants	Non-entrants	All workers	Entrants	Non-entrants	All workers	Entrants	Non-entrants
RD Estimate	0.0614**	0.762***	0.0481*	0.0913	0.568**	0.0679	0.0531*	0.874***	0.0427
	(0.0271)	(0.187)	-0.0274	(0.0647)	(0.288)	(0.0665)	(0.0297)	(0.244)	(0.0299)
Obs.	1,204,687	99,309	1,105,378	318,168	20,211	297,957	886,519	79,098	807,421

Maximum 6 months of noncontribution duration

	All Contracts			Open ended			Fixed term		
	All workers	Entrants	Non-entrants	All workers	Entrants	Non-entrants	All workers	Entrants	Non-entrants
RD Estimate	0.0388**	0.248**	0.0346**	0.0169	-0.0831	0.0240	0.0449**	0.444***	0.0381**
	(0.0161)	(0.103)	(0.0163)	(0.0379)	(0.171)	(0.0389)	(0.0177)	(0.126)	(0.0179)
Obs.	960,684	66,859	893,825	248,930	14,576	234,354	711,754	52,283	659,471

Maximum 3 months of noncontribution duration

	All Contracts			Open ended			Fixed term		
	All workers	Entrants	Non-entrants	All workers	Entrants	Non-entrants	All workers	Entrants	Non-entrants
RD Estimate	0.0162*	0.195***	0.0109	0.00592	0.0944	0.000510	0.0191*	0.226***	0.0139
	(0.00919)	(0.0575)	(0.00931)	(0.0223)	(0.0982)	(0.0229)	(0.0100)	(0.0695)	(0.0102)
Obs.	716,428	46,283	670,145	172,231	9,582	162,649	544,197	36,701	507,496

Standard errors in parentheses. All regressions use 4 months for bandwidth.

*** p<0.01, ** p<0.05, * p<0.1

Table A4 shows results to be consistent with previous estimates. When halving noncontribution durations (from 24 months in the paper to 12 months), effects are roughly halved. We get a similar trend when looking at 6 and 3 months. Effects are to a large extent explained by entrants with fixed term contracts. Even if informal work plays a role in extending the noncontribution durations, we find that the results are consistent for shorter durations, where employment outside of the formal private job market is unlikely.

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