Pontifícia Universidade Católica
do Rio de Janeiro

Davi Prado Novais Moura

Do apprenticeship programs increase labor market opportunities?

Dissertação de Mestrado

Thesis presented to the Programa de Pós–graduação em Economia, do Departamento de Economia da PUC-Rio in partial fulfillment of the requirements for the degree of Mestre em Economia.

Advisor: Prof. Tomás Guanziroli

Rio de Janeiro
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Abstract

Prado Novais Moura, Davi; Guanziroli, Tomás (Advisor). **Do apprenticeship programs increase labor market opportunities?**. Rio de Janeiro, 2023. 50p. Dissertação de Mestrado – Departamento de Economia, Pontifícia Universidade Católica do Rio de Janeiro.

This paper studies the impact of one of the largest apprenticeship programs in the world, the Jovem Aprendiz program in Brazil, on firms' hiring decisions. The program aimed to expand job opportunities among young individuals by combining tax incentives and hiring quotas for firms to hire apprentices. However, these incentives do not prevent firms from substituting non-apprentice contracts for apprentice contracts. To assess these effects, we use a staggered differences-in-differences approach that leverages an exogenous threshold for entry into the program. Our results indicate that firms increase the hiring of apprentices after surpassing the threshold. However, this rise is accompanied by a decline in the entry of non-apprentices first-time workers, consistent with the substitution hypothesis.

Keywords

Apprenticeship; Hiring quotas; Labor Market Entry.

Resumo

Prado Novais Moura, Davi; Guanziroli, Tomás. **Programas de aprendizagem aumentam as oportunidades no mercado de trabalho?**. Rio de Janeiro, 2023. 50p. Dissertação de Mestrado – Departamento de Economia, Pontifícia Universidade Católica do Rio de Janeiro.

Este artigo estuda o impacto de um dos maiores programas de aprendizagem do mundo, o programa Jovem Aprendiz no Brasil, nas decisões de contratação das empresas. O programa teve como objetivo expandir as oportunidades de emprego para jovens, combinando incentivos fiscais e cotas de contratação para que as empresas contratem aprendizes. No entanto, esses incentivos não impedem que as empresas substituam contratos de não aprendizes por contratos de aprendizes. Para avaliar esses efeitos, utilizamos uma abordagem de diferenças em diferenças escalonadas, que aproveita um limite exógeno para a entrada no programa. Nossos resultados indicam que as empresas aumentam a contratação de aprendizes após ultrapassar o limite. No entanto, esse aumento é acompanhado por uma redução na entrada de trabalhadores entrantes que não são aprendizes, o que é consistente com a hipótese de substituição.

Palavras-chave

Aprendizagem; Quotas de Contratação; Entrada no Mercado de Trabalho.

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CLT – *Consolidação das Leis do Trabalho* (Consolidation of Labor Laws)
RAIS – *Relação Anual de Informações Sociais* (Annual Social Information Report)
ITT – Intention-to-treat
SESC – Serviço Social do Comércio (Social Service of Commerce)
SENAI – *Serviço Nacional de Aprendizagem Industrial*(National Industrial Apprenticeship Service)
ECA– *Estatuto da Criança e Adolescente* (Statute of the Child and Adolescent)
CONAP – *Catálogo de Programas de Aprendizagem Profissional*(Catalog of Professional Apprenticeship Programs)
CIEE – *Centro de Integração Empresa-Escola* (Company-School Integration Center)
SENAC– *Serviço Nacional de Aprendizagem Comercial* (National Commercial Apprenticeship Service)
SESI – *Serviço Social da Indústria* (Social Service of Industry)
SENAR – *Serviço Nacional de Aprendizagem Rural* (National Rural Apprenticeship Service)
IRPJ – *Imposto de Renda de Pessoa Jurídica* (Corporate income tax)
PIS/PASEP – *Programa de Integração Social e o Programa de Formação do Patrimônio do Servidor Público* (Contribution to employees' saving program)
CLSS – *Contribuição Social sobre Lucro Líquido* (Contribution on net profit)
COFINS – *Contribuição para o Financiamento da Seguridade Social* (Contribution for financing the social security system)
IPI – *Imposto sobre Produtos Industrializados* (Industrialized products tax)
ICMS – *Imposto sobre Circulação de Mercadorias e Serviços* (Value-added tax)
ISS – *Imposto sobre Serviços de Qualquer Natureza* (Service tax)
ATT – Average treatment Effects on Treated

1
Introduction

Young individuals face many challenges when entering the labor market —a feature common in most developing economies in the world (OECD, 2022). This is particularly true for underrepresented minorities. To tackle this problem, several countries implemented employment programs for the youth, which combine tax incentives and mandatory quotas for firms to hire young workers (Card et al., 2018). Although there is substantial evidence of the benefits of these programs for employees(Corseuil et al., 2019; Dias, 2022; Card et al., 2018), there is still a gap in how these initiatives influence firms' behavior. That is, it is unclear whether these initiatives create new job opportunities or result in a substitution away from non-apprentice contracts.

In this paper, we assess the effect of one of the largest apprenticeship programs in the world, the *Jovem Aprendiz* program in Brazil. Specifically, our analysis focuses on how the program influences firms' hiring decisions with respect to apprentices, first-time workers (excluding apprentices), and underrepresented minorities. To identify the program's effects, we use a discontinuity in the law that mandates firms to hire apprentices. In Brazil, firms that cross a certain revenue threshold[1] must hire apprentices such that these workers represent at least 5% of the firm's workforce (SINAIT, 2019).[2]. We employ a staggered differences-in-differences approach to compare the hiring patterns of firms before and after they exceed the revenue threshold, thereby making apprentice hiring mandatory. Our findings indicate that, after surpassing the threshold, firms tend to substitute hiring first-time low-skilled workers from regular open-ended contracts to apprenticeship contracts.

The *Jovem aprendiz* program, which began in 2000, introduced an apprenticeship system within the Brazilian labor market. The program combines tax incentives for firms in the form of reduced payroll taxes and imposes hiring quotas for apprentices. The tax incentives in apprentices contracts consist of two components: exemption from firing costs and a 6 p.p. reduction in payroll

[1]This revenue threshold can change over the years, for example, in 2016 the value changed from R$ 3.6 million (or US$1.08 million at the time) to R$ 4,8 million (US$1.45 million at the time).

[2]Firms that do not comply with the law can face financial penalties.

taxes, compared to regular open-ended CLT contracts. In addition, apprentices are required to undergo vocational training in government-approved centers[3].

At first sight, the implementation of the program appears to be successful. However, it is unclear if firms are increasing opportunities for first-time workers or changed their hiring practices for labor market entrants to decrease payroll taxes and avoid fines. As an example of its influence in the labor market, in 2015, more than 400,000 young workers joined the formal labor market through this program, from less than 80,000 in 2005. This figure accounted for more than 17% of all age-eligible entrants in the labor market for that year.

Instead of promoting an increase in hiring for young workers, mandates and tax breaks could alter how workers enter the job market. For example, a firm planning to hire a first-time worker may find it more profitable to choose an apprentice contract than an open-ended one. The firm's preference for an apprentice contract by the firm may stem from the reduced payroll expenses and the change in the likelihood of paying fines. Additionally, the characteristics of apprentice contracts, such as age limits and the requirement to be currently studying, may result in a more homogeneous pool of applicants. Consisting mostly of individuals who have not completed high school or recently graduated. This shift could potentially promote greater racial diversity by reducing disparities among applicants.

To follow firms and observe their treatment status and hiring patterns, we use the Brazilian linked employer-employee data RAIS (*Relação Anual de Informações Sociais*). RAIS is a dataset that encompasses all formal sector employment contracts in Brazil. Although it does not include information on firms' revenue, we utilize an indicator of participation in the Simples Nacional program to indicate when firms surpassed the revenue threshold. This program is a simplified tax system for small firms and shares the same revenue threshold as the *Jovem Aprendiz* (SINAIT, 2019). It is essential to highlight that once a firm surpasses this threshold, it becomes mandatory for them to exit the program, effectively serving as a proxy for the change in the compulsory nature of hiring apprentices.

We construct a dataset of firms that participated in the Simples Nacional in 2002 and exited the program between 2007 and 2015, never opting to re-enter the tax program. This gives us a balanced panel of firms from 2002 to 2014, contemplating nearly all periods since the *Jovem aprendiz* creation. We identify first-time workers as individuals with their first apparition in RAIS

[3]The government can provide these courses in municipalities Sistema S branch is available. These are institutions financed by payroll taxes of firms in the industry that they are related. They provide vocational courses and consulting for firms. In the absence of these institutions, firms must pay for vocational training out-of-pocket.

in a given firm and year, and apprentices are workers with an apprenticeship contract.

To identify the program's effects on firms' first-time workers' hiring outcomes, we use a staggered differences-in-differences approach (Callaway & Sant'Anna, 2021). Firms are considered to be treated the first year after they exit the simplified tax system, and we compare early-treated to those treated in later years. Our main assumption is that, in the absence of the program, both early and late-treated firms would not change their hiring patterns of first-time workers after crossing the revenue threshold. It is worth noting that firms can exit the Simples program for reasons other than reaching the revenue threshold. Because we do not observe the actual treatment status, our estimation thus represents an intention-to-treat (ITT) effect.

In the first part of the paper, we show that firms hire more apprentices once they exceed the mandatory hiring threshold. Specifically, we observe an overall increase of 7 apprentices hired for every 100 firms. This is true and increases for every period after reaching the threshold and is not driven by a particular period. These results suggest a consistent and ongoing commitment of firms to the program. However, it is important to note that the relatively low value of the increase could be attributed to the low level of compliance with the program (Corseuil et al., 2019).

Despite an increase in apprentice hiring, our main result shows no corresponding increase in the overall hiring of first-time workers, accounting for apprentices. Our estimates for each period following the threshold are not statistically significant. Combined with the previous result, this suggests that the program prompts firms to substitute first-time contracts rather than leading to additional employment opportunities for first-time workers.

The lack of increase in first-time workers can be attributed to the substitution of low-skilled entrants. We find a decrease in the number of non-apprentice first-time workers that did not complete high school. Specifically, we find a statistically significant aggregate effect, with a 5% decrease in the number of first-time workers with this level of education. This finding further supports the argument of substitution on entry. Since apprentices predominantly fill low-skilled entry-level positions, such as administrative assistants or retail workers.

In the second part of the paper, we study which contracts and demographic groups are most affected by substitution. First, we investigate the types of contracts firms are substituting for apprenticeship contracts. We find that the decline in the entry of low-skilled non-apprentice first-time workers primarily stems from open-ended contracts. We observe a 5% decline in hiring

first-time workers, from this group. In contrast, we do not find any statistically significant effect on entry through temporary jobs.

Moreover, we look into how this substitution affects different demographics. We find that the decrease in the entry of low-skilled workers through CLT contracts predominantly impacts nonwhites and male entrants. Specifically, we observe a 4% decrease in the entry of nonwhite individuals through open-ended contracts, while male entrants experience a 6% decline in entrance through this type of contract.

However, we find that the increase in entrance into the formal job market through apprenticeship contracts is higher for white and male individuals. Across each period, we find an average effect of 7 new white apprentices and 6 new male apprentices for every 100 firms. These findings might suggest the presence of substitution dynamics between white and nonwhite workers, highlighting a potential shift in the composition of the workforce. Employers may encounter a different pool of applicants when offering apprenticeship contracts.

It is important to note that these findings should not be interpreted as indicating an overall negative impact of the program on employment for minorities. It is crucial to consider the characteristics of our sample, which primarily comprises small to mid-sized firms. These firms may face financial constraints when hiring apprentices and, because of that, need to engage in substitution practices. Thus, the observed effects on minority workers should be understood within the context of these specific firms.

In the third part of the paper, we investigate what determines apprenticeship hiring. In developing countries, labor market policy compliance is often low. On the one hand, economists often argue that higher enforcement through active inspections should increase compliance. On the other hand, reducing the cost of compliance can also have a high effect on firms' compliance with the law. We test both hypotheses in our setting by exploring geographical variation in labor inspection, proxied by the distance of labor offices branches(Almeida & Carneiro, 2012), and the location government supplied training for apprentice workers (SESC and SENAI).

We find that compliance with the program is larger in municipalities with the presence of a *Sistema S* branch, but not different in those nearer labor offices branches. Firms operating in municipalities where government-provided courses are available hire twice as many apprentices as those without the presence of these courses. This result holds even after excluding state capitals from our sample also, suggesting that this effect is not driven by large cities. The absence of enforcement effect does not imply that enforcement is

irrelevant. Instead, it might suggest that the firms in our sample may have a lower likelihood of being selected for inspections. The role of law enforcement remains essential in ensuring compliance with regulations (Szerman, 2022; Ponczek & Ulyssea, 2021; Almeida & Carneiro, 2012), but our findings may reflect the specific targeting strategies employed by labor offices in their enforcement activities.

The remainder of this paper is structured as follows. Section 2 presents a literature review of apprenticeship programs and hiring quotas. Sections 3 and 4 describe the institutional context and data. Section 5 describes our empirical strategy. Section 6 presents how firms make adjustments and how it affects workers. Section 7 concludes.

2
Literature Review

We contribute to the literature that evaluates the efficiency of employment programs, specifically, those looking to improve labor market entrance for young adults. There is a large literature on the effects of employment policies on youth entrance into the labor market. Card et al. (2018) do a meta-analysis of various papers on employment programs and show that, on average, youth, and mostly women, benefit more from employment programs. Either those programs that only provide training or those programs that provide subsidies to increase youth hiring.

However, there is mixed evidence on the effectiveness of these programs. On the one hand, some studies in developing countries also find that the effects of vocational training are only relevant in the short run. Hardy et al. (2019), studies a program in Ghana and finds that the group which received vocational training has increased participation in self-employment, decreasing earnings. Acevedo et al. (2017), finds that vocational training positively impacts women's labor market outcomes and a negative impact on men's, but no effect in the long run. In addition, Hirshleifer et al. (2016), also find an increase in employment and earning and a spike in formal market participation. However, the authors find that effects dissipate in the medium term.

On the other hand, Attanasio et al. (2017), on a follow-up study of a randomized Colombian training program. The authors find that this program's positive effects on employment, formal participation, and earnings are persistent in the long run. In summary, results on the long-run effects are still mixed, but short-run effects are positive.

These programs also try to increase human capital by providing on-the-job or vocational training. Das (2021) studies a program that resembles our setting and can disentangle the effects of on-the-job and vocational training. The authors find that both types of training improve future employment and earnings. However, these effects differ in gender, with higher employment effects for women and earnings effects for men.

Differences in the type of training carried out, vocational or firm-provided, and the persistence of the effects are additional factors to consider. Alfonsi et al. (2020), carry out a labor market experiment on Uganda, finds

that while firm training increase gains in the short run, vocational training improves labor market outcomes in the long run. This is attributed to the certification obtained by the workers through vocational training, which reduces informational costs for firms.

We contribute more directly to the literature on the Brazilian apprenticeship program *Jovem Aprendiz*. The evidence for this apprenticeship program is relatively recent. Corseuil et al. (2019) finds that the program is effective as a stepping stone, improving participants' future labor market outcomes, such as increasing formal employment and decreasing turnover rates. Furthermore, the authors find that apprenticeship positively affects schooling and receiving a college degree. To identify the program effects, they use the program's age limit in 2000 to compare 18 y.o. temporary workers to 17 y.o apprentices. Dias (2022) finds that the program has an effect of a decrease in college enrollment but an increased probability of completion. The paper uses a leave-one-out instrumental variable approach to study the program's impact on high-school-aged teenagers' education choices. They find that conditional on having a job, those that take up the apprenticeship have higher earnings. In addition, the program shows positive effects on employment in the short and medium run. These apprentices stay out of the labor market to increase their education, having a higher probability of completing secondary education than their counterparts. Our paper focuses on the program's effects on firms' choices, and we find that firms are substituting which type of contract first-time workers receive.

Our paper is also related to the literature on the effects of hiring quotas on firms, that is, on the demand side of the labor market. Most of this work is done for hiring quotas on minorities (Welch, 1976; Griffin, 1990; Peck, 2017; Prakash, 2020) and workers with disabilities (Szerman, 2022). To the best of our knowledge, this is the first paper to study the demand side of the Brazilian apprenticeship program. This is in line with the lack of evidence regarding the indirect effects of apprentice programs on developing countries, as we might expect that firms will change their decisions when required to employ. Crépon & Premand (2018), which analyses the indirect impact of a subsidized apprentice program in Côte d' Ivoire using a randomized experiment on whether firms have to open apprenticeship positions, and found that, although firms hire more apprentices, there is a substitution effect on traditional apprenticeships.

Caicedo et al. (2022) study a setting in Colombia where firms have mandatory hiring quotas and training comes out of pocket. The authors find that for the more specialized firms, where training is more costly, there is a decrease in hiring. Also, these firms are more likely to choose to pay fines for

not hiring apprentices. This can be translated for the Brazilian case, as for some firms, training has to come out-of-pocket, as they do not have a *sistema S* nearby. Ospino (2016) calls this labor regulation a size-dependent tax and obtains similar results, which is only seen in directly contracted employees, increasing outsourced labor.

3
Institutional Framework

3.1
The Jovem Aprendiz Program

To increase labor market entrance, decrease turnover of youth, and ease school-to-work transition, Brazil enacted Law 10.097/2000, known as *Lei da aprendizagem* (Apprenticeship[1] Law). The law introduced a new type of contract specifically for individuals of age 14 to 17 enrolled in middle or high school. The primary objective of this law was to increase the participation of young people in the labor market and reduce job turnover within this age group. Under this law, companies with more than seven employees were required to hire at least 5% of their workforce as apprentices.

In 2005, the law underwent modifications that introduced changes to the program. These included a revenue threshold compulsory apprentice hiring by firms and increased the maximum age limit for program participation [2]. Additionally, a formula was established to determine the minimum number of apprentices each firm was required to hire.[3]

According to the law, middle-school students participating in apprenticeship programs can work up to 6 hours per day, while high school students can work up to 8 hours. These working hours encompass both vocational training and on-the-job experience. Additionally, apprentices are entitled to at least the minimum hourly wage for each contracted hour. A recent survey from

[1]This law was not the first instated for apprenticeships in Brazil, which has a long history of professional training, either informally or by law. Such as, Decree nº 7.566 in 23^{rd} of September of 1909 created apprenticeships schools. After that, with the creation of Senai, in 1942.

[2]Although the change increased the maximum age allowed for apprentices, the program's focus still is teenagers between 14 to 17 y.o., as this group cannot perform some jobs because of the *Estatuto da Criança e Adolescente* (ECA) that prohibits those younger than 18 from performing some activities. To inform the firms which kind of jobs this group cannot perform, the Ministry of Labor updates a list of the six-digit job every year and the age limits for each apprenticeship, the *Catálogo de Programas de Aprendizagem Profissional* (CONAP).

[3]This calculation considered the number of employees whose occupations did not require higher education or were not on the board of directors. For example, if a firm had 100 employees but only 20 held positions that did not require higher education and were not part of the board of directors, the firm would only hire one apprentice instead of five as previously mandated.

CIEE [4] shows that the prominent positions where apprentices are hired are administrative assistants, packing shelves, and retail sellers.

The apprenticeship contract offers some advantages to incentivize firms to engage in the program(see Appendix Table B.1 for detailed comparisons of contracts). One key advantage is a reduction in payroll taxes. Compared to a standard open-ended CLT contract, where firms are required to pay 8% of the worker's wage in FGTS [5], the contribution for apprentice contracts is only of 2%. Additionally, when terminating this type of contract, firms do not bear any costs, even if it is before the agreed-upon period[6].

Although terminating an apprentice contract does not incur any costs to the firm, employers are not permitted to terminate these contracts unilaterally. To terminate an apprentice contract, the approval of the vocational training center is required. It is important to note that even though apprenticeship contracts can last up to two years, they cannot be renewed if the initial contract duration is shorter than this length. To retain the apprentice employed, the firm must initiate a new employment contract that does not fall under the apprenticeship category. This ensures that firms do not create a trial period for apprenticeships.

Additionally, firms must enroll the apprentice in vocational training related to their occupation. This ensures that the apprentice receives a combination of on-the-job training and theoretical education. Vocational education can be provided by institutions within the Sistema S[7], which are funded by payroll taxes, and thus firms do not have to pay directly. However, when these institutions are unavailable, firms must enroll apprentices in government-approved institutions and cover the associated costs themselves. Corseuil et al. (2019) highlights that one of the primary challenges in expanding the number of apprentices is the limited availability of slots for vocational education.

The availability of apprentices positions is not evenly distributed in the country. On the one hand, from 2009 to 2015, there was a significant increase in the number of apprentice positions. In figure 3.1, we show this trend, showing a rising trend in the number of apprentices hired following the 2005 modification, with further growth after 2009.

On the other hand, we show in figure 3.2 a geographical perspective of apprenticeships, highlighting the distribution of apprentices across microregions. Apprenticeship opportunities are higher in the south and southeast regions.

[4]https://portal.ciee.org.br/pesquisa/aprendiz-ciee-datafolha/

[5]*Fundo de Garantia do Tempo de Serviço* - Is a severance fund organized by the government to protect workers that were unjustifiably dismissed.

[6]This differs from usual temporary contracts as if they were unfairly dismissed, the employer had to pay 1/12 of the total payment received

[7]Such as SENAI, SENAC, SESI, SESC, SENAR

This can be partially attributed to the availability of vocational training offered by the*Sistema S* courses, as depicted in figure A.1.

In figure 3.4, we show which industries and occupations apprentices are mainly employed in. As expected, apprentices are predominantly allocated to low-skilled positions, such as administrative assistants and retail store workers. The industries in which they are most concentrated are non-profit organizations and the retail sector.

Finally, there are significant gender and racial disparities in the apprenticeship program entrance. Figure A.2, displays the proportion of first-time workers, categorized by race and gender, who entered the formal labor market through apprenticeships. Furthermore, it highlights that entrance into the labor market through apprenticeship has risen throughout the years, peaking in 2015, particularly for black women at 27%. Notably, there is substantial variation in educational attainment among apprenticeship entrants. Figures A.3 and A.4 indicate that a significant proportion of entrance through apprenticeship comes from workers with less than a high school education, accounting for nearly 40% of all labor market entrances in this group. In contrast, only 8% of entry from those that completed high school (and did not complete any higher education) is attributed to apprenticeships.

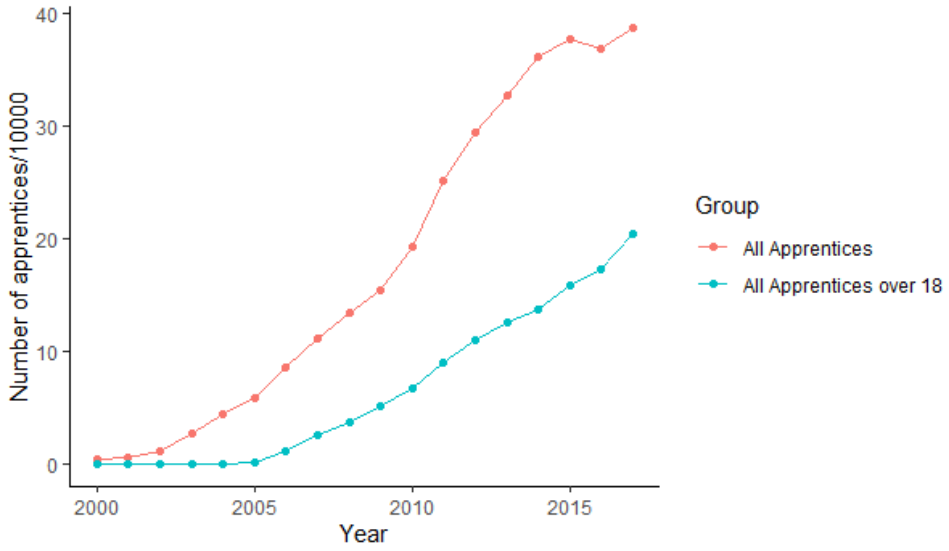


Figure 3.1: Evolution on the number of young apprentices

Note: This figure shows the number of apprentices contracts in Brazil by year, separating those over 18. We only count active contracts on December 31st to avoid double counting. Source: RAIS

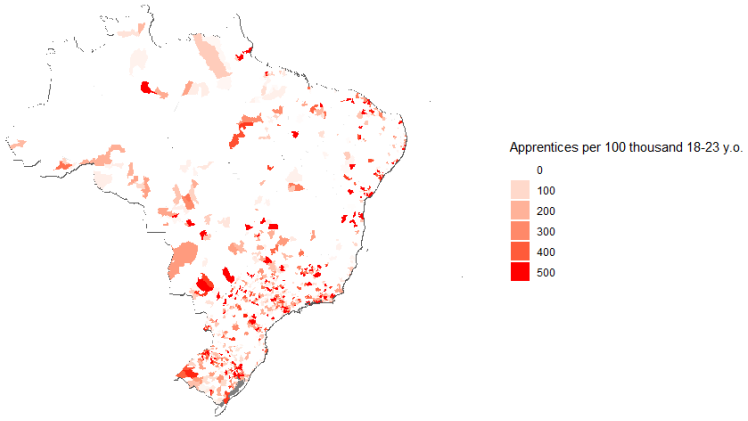
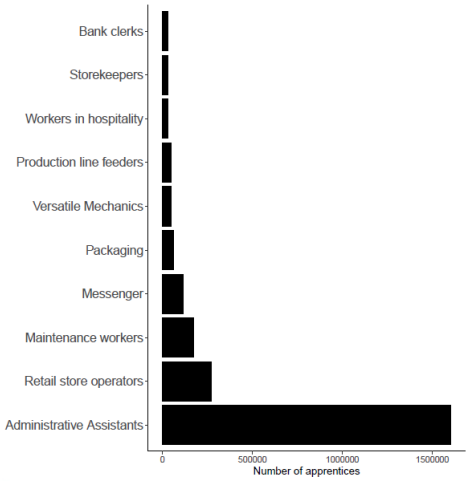


Figure 3.2: Proportion of apprentices on the 18-23 y.o. population

Note: This figure shows the proportion of apprentices per 100 thousand 18-23 y.o. in each microregion in 2010. We use census data to get the proportion of residents in this age range. We only count active contracts on December 31st to avoid double counting. Source: RAIS and Censo 2010



Occupations (a)

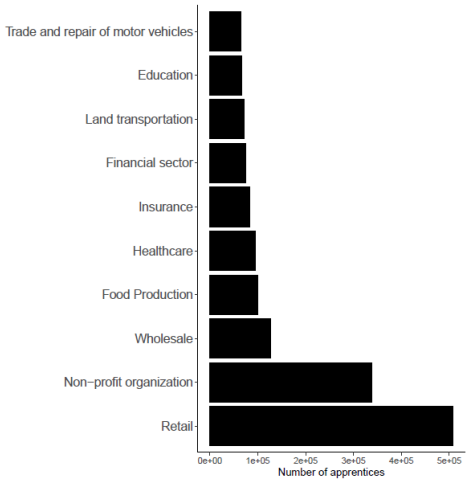


Figure 3.3: Industries (b)

Figure 3.4: Occupations and industries that apprentices are employed

Note: These figures present the occupations and industries that employ apprentices for all years. (a), shows the top 10 occupations apprentices enter, using the 4 digits occupation in CBO 2002. (b) show the top 10 2-digit industries in CNAE. Apprentices here are those who have their first job as an apprentice. Therefore, each worker only appears once. *Source: RAIS*

3.2 Simples Nacional

The Simples Nacional tax system was introduced in 1996 as a simplified taxation framework designed to streamline the payment of various state and federal taxes for micro and small firms in Brazil. This law underwent significant

overhauls in 2006 and 2016, changing caps and which taxes participated in the program. Under this system, instead of the firm paying up to eight taxes separately, such as corporate income tax (IRPJ), contribution to employees' saving program (PIS/PASEP), contribution on net profit (CSLL), the contribution for financing the social security system (COFINS), industrialized products tax (IPI), value-added tax (ICMS), and service tax (ISS), firms under the Simples Nacional program can consolidate these payments into a single payment. By consolidating payments in one slip, firms benefit by reducing administrative burdens, tax calculation costs and time, and bureaucracy. Firms can fulfill their tax obligations with unique monthly payments rather than dealing with multiple payment slips and separate tax calculations.

Table 3.1: Firm sizes and simples eligibility

Firm Size	Accumulated gross revenue threshold	Simples Eligibility
MEI	Gross Revenue<R$81,000.00	Yes
Micro enterprise	R$81,000.00<Gross Revenue < R$ 360,000.00	Yes
Small firm	R$360,000.00<Gross Revenue < R$ 4,800,000.00	Yes
Medium-sized firm	R$4,800,000.00 < Gross Revenue < R$ 300,000,000.00	No
Large Firms	Gross Revenue>300,000,000.00	No

Note: This table presents the thresholds of firm sizes and the eligibility of Simples participation by gross revenue in 2018.*Source: Lei Complementar Nº 123, 2006*

To enter the program, the firm has to be considered one of three sizes, that are considered by their revenue, MEI, Microenterprise, or small firms, and need to have gross annual revenue of less than R$4,800,000.00 [8], after that firms are considered of medium size, as shown in table 3.1.

Upon opting into the Simples tax system, a business need not participate in the yearly selection process. Instead, the company will remain in the scheme unless it exceeds the revenue threshold or chooses to leave. In the first case, firms that exceed the accumulated 12 months' revenue by less than 20% can be kept on the program until the next fiscal year. However, if this second threshold is exceeded the firm leaves in the month of change. In such a scenario, the business will join the regular tax system in the subsequent fiscal year[9].

[8]These limits can be updated.

[9]Brazil has two other calculation methods: presumed profit and real profit. Firms with a low-profit margin may benefit from these calculations. However, Simples may have an edge for these firms because it allows the payment of some taxes together instead of individually, decreasing the time cost of calculating these taxes

4
Data

For this exercise, we mainly use the 2000-2017 edition of *Relação Anual de Informações Sociais* (RAIS) to get information when firms first hire an apprentice, as there is a unique identifier for apprenticeship contract.

In addition, we got all the firms in the Simples Nacional, i.e., firms that chose to enter a simplified tax system, in which only firms that have revenue in which they are considered small or micro-enterprises. This is a proxy for when a firm needs to employ apprentices[1]. Because revenue is a variable that can fluctuate, firms may exit and enter this simplified tax system in different years. Therefore, we consider a firm not in Simples if it is outside, at least for three years, and never goes back to it, i.e., the last year that a firm can appear on SIMPLES to be considered as treated is 2014.

Additional datasets. To study the determinants of hiring apprentices we use other two datasets. First, use the location of all Sesc and Senai branches in Brazil, to obtain this dataset we scraped the address of each branch through their websites and got their locations using the google maps API. We also use the dataset provided in Ponczek & Ulyssea (2021), on labor offices distances from the municipality centroid.

4.1
Sample selection

To construct our sample, we begin by selecting all firms that participated in the Simples Nacional program in 2002, the first year that this variable is available in the RAIS dataset. This selection criteria ensure compatibility among firms of the same size in the pre-treatment periods. We identify firms that exited the program between 2007 and 2015, allowing for at least three years of non-participation. Firms with fewer than seven employees are subsequently excluded, as they are not required to hire apprentices regardless of their revenue. Finally, we balance our panel by removing firms that do not appear in all periods of our sample, thus excluding companies that closed

[1]As we do not have information on the reason the firm exited the Simples, our proxy of firm size may have some measurement error. Firms may choose to leave the program other tax systems are more advantageous, as well as firms that were kicked out of the program.

during the observation period. Our final sample consists of 3,971 firms in the treated (early treated) and 302 firms in the control (late treated) group.

4.2 Descriptive Statistics

Table 4.1 displays the descriptive statistics for the treatment for our treatment (early-treated) and control (late-treated) groups on the period before the treatment. Both treatment and control exhibit a similar number of workers on December 31th, a similar number of apprentices, a share of nonwhite, and a share of female workers. Additionally, we observe a comparable number of first-time workers, indicating a similar pattern of hiring entrant workers.

In figures 4.1 and 4.2 we show the trends observed in early-treated establishments(treated group) and late-treated establishments(control group). Prior to treatment, both groups exhibited similar trends in the number of apprentices hired, which diverged following the exit from the Simples Nacional program. In contrast, the number of non-apprentice workers shows no such divergence. Figure **??** further illustrates the trends in first-time workers between early-treated and-late treated establishments. Finally, in Figure A.9 we show the top 10 industries and top 10 occupations of apprentice hiring within the firms in our sample. Similar to the overall population of apprentice workers, the administrative assistant occupation stands out as the predominant role for apprentice workers. Additionally, the retail industry appears as the predominant sector for apprentices hired.

Table 4.1: Descriptive statistics of the establishments - Pre-Treatment

	Early-treated (Treatment group)	Late-treated (Control group)
Firm characteristics		
Employees	32.63	34.86
	(49.39)	(27.98)
Apprentices	0.026	0.014
	(0.72)	(0.24)
Share nonwhite	0.25	0.30
	(0.27)	(0.30)
Share female	0.35	0.43
	(0.26)	(0.28)
Distance to labor office (km)	29.68	29.72
	(55.50)	(65.87)
Senai/Sesc presence	0.68	0.75
Entrace statistics		
First-time workers	2.96	3.06
	(5.47)	(5.45)
First-time (< High school)	1.56	1.31
	(3.21)	(3.23)
First-time (High school)	1.37	1.70
	(3.72)	(3.19)
Number of firms	3971	302

Note: This table presents the descriptives statistics for the treated (*Early treated*, those treated before 2015) and control (*Late-treated*, those that were treated after 2015). For the treatment groups, the averages and standard deviation (in parenthesis) are from 2002 until the year that they were treated, and the control group contain all the sample period 2002-2014. The sample contains all establishments that exit Simples nacional and never enter again and never close in our sample period. First time workers are those workers that have their first appearance in RAIS

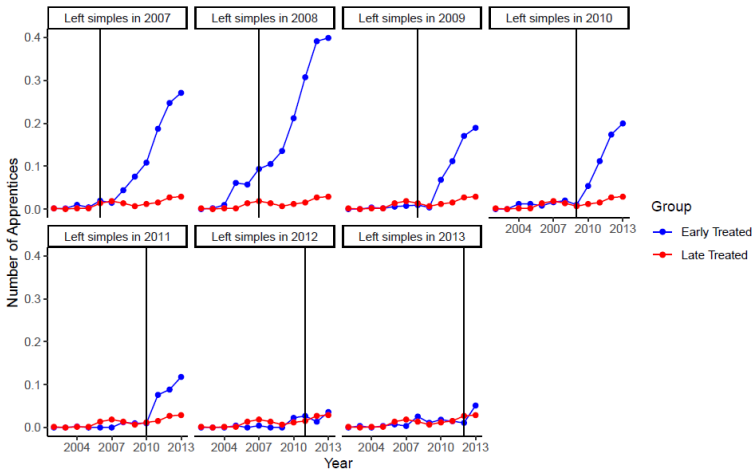


Figure 4.1: Trends for IHS(apprentice workers) between treated and late treated

Note: This figure presents the trends between the early-treated - shown by the blue line- and the late-treated establishments of the inverse hyperbolic sine of the number of apprentice workers that are employed by the firm on the 30th of December of each year, divided by the year of treatment of the early-treated establishments. The vertical line on each graph shows the period pre-treatment

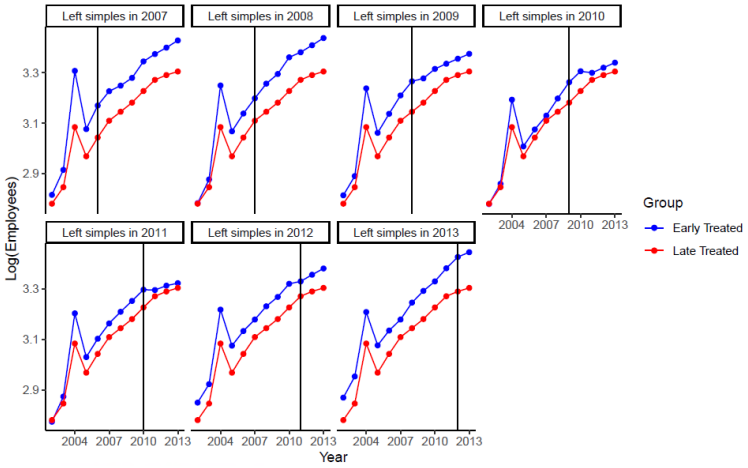


Figure 4.2: Trends for Log(Non-apprentice employees) between treated and late treated

Note: This figure presents the trends between the early-treated - shown by the blue line- and the late-treated establishments of the logarithm of the number of non-apprentice employees in the firm on the December 30th of each year, divided by the year of treatment of the early-treated establishments. The vertical line on each graph shows the period pre-treatment

5
Empirical Strategy

This paper examines how an apprenticeship program affects firms' hiring practices for first-time entrants in the formal labor market. However, the study faces a challenge due to the nature of the program implementation. The change in the law applies to all firms, but due to limited enforcement, firms can choose whether to participate in the apprenticeship program or not. This means that establishments may vary in pre-program levels and trends, making it challenging to identify the program's effects through a simple comparison in post-treatment hires.

To address the issue of pre-existing differences, we adopt a differences-in-differences approach. However, since the treatment occurs in a staggered form, that is, firms are treated in different years, the canonical difference-in-differences framework may incur in comparisons between already treated groups, therefore, if there is substantial heterogeneity in treatment effects among cohorts, and our estimations would be biased, as highlighted by Goodman-Bacon (2021). To mitigatethis problem, we use the estimator proposed by Callaway & Sant'Anna (2021) [1]. We estimate the average treatment effect on the treated (ATT) for each cohort g and period t by comparing outcome trends between early-treated and late-treated firms, assuming that the trends would be parallel if the firms did not exit the Simples Nacional program.

Let $i \in \{1, 2, ..., N\}$, be a pair firm-establishment, with $t \in 2002, ..., 2013$, years and $G_i = g \in 2007, ..., 2011$ treatment cohorts, D_t, is a binary variable that takes 1 if the firm is already treated and 0 otherwise. The expression for ATT is given by:

$$ATT^{my}(g,t) = \mathbb{E}[Y_t - Y_{g-1} \mid G_g = 1] - \mathbb{E}[Y_t - Y_{g-1} | D_t = 0, G_g = 0] \quad (5\text{-}1)$$

To estimate the ATT, we compute the differences in differences between the early-treated group (represented by the first term on the right-hand side) and the not-yet-treated group (represented by the second term). Callaway & Sant'Anna (2021) propose a model with a varying control group, but we use

[1] There is a considerable body of literature that highlights the shortcomings of the canonical two-way fixed effects model in a staggered treatment setting and how to overcome it. For a comprehensive review, see Roth et al. (2022)

the not-yet-treated group identified by Sun & Abraham (2021) to observe differences between firms that hire apprentices and those that do not. Specifically, we use the late-treated units, which are the firms that exited the Simples Nacional program in 2014 and 2015. Therefore, given that $\Delta Y_{i,t,g-1} = Y_{i,t} - Y_{i,g-1}$, is the evolution of the outcome $Y = IHS(\text{First time in the labor market})$, in a given period t, relative to the period before the treatment, $g-1$, therefore our estimator will be:

$$\hat{ATT}^{ny}(g,t) = \frac{\sum_i \Delta Y_{i,t,g-1} 1\{G_i = g\}}{\sum_i 1\{G_i = g\}} - \frac{\sum_i \Delta Y_{i,t,g-1} 1\{D_t = 0, G_g = 0\}}{\sum_i 1\{D_t = 0, G_g = 0\}} \quad (5\text{-}2)$$

This is similar to the two periods and the two groups' canonical differences and differences, in which we compare the average evolution of the treated group between t and $g-1$, with the average evolution of the control groups.

We present the results of an event study aggregation, focusing on those that we can observe by at least five years before leaving the tax program and three years after. To evaluate the magnitude, we combine these estimates into a single measure, using the aggregation suggested on Callaway & Sant'Anna (2021), in which cohorts with more treated groups receive more weight. Giving a result similar to the Dynamic TWFE, and aggregate on the form:

$$\theta_e = \sum_{g \in 2007,\ldots,2011} w(g) \cdot \hat{ATT}(g, g+e) \quad (5\text{-}3)$$

Where θ_e is the weighted estimation of the effect on the period t, and $w(g)$ is the weighting function, given by:

$$w(g) = 1\{g + e \leq 2013\} P(G = g \mid G + e \leq 2013) \quad (5\text{-}4)$$

That is, for all groups that we observe $g + e \leq 2013$, the probability of observing one of cohort g given all the treated groups that were observed before the last year of our sample. Therefore it could be written as:

$$P(G = g \mid G + e \leq 2013) = \frac{N_g}{\sum_{g \in G} 1g + e \leq 2013} \quad (5\text{-}5)$$

Where N_g is the number of firms in cohort g

5.1 Identification and summarizing

The identification of the $ATT(g,t)$, relies on three assumptions. The first one, irreversibility of treatment, requires that once a firm is treated, it will remain treated permanently. In our context, this implies that firms that exit Simples in the year of treatment do not experience reduction in their revenue, that would make them eligible for reentry in the subsequent years.

In a scenario of this occurring, firms would not be required by law to hire apprentices. To prevent that, we exclude firms that return to the program after the first exit. However, a limitation in our data is that we do not directly observe firms' revenue. Therefore, the decision of firms to opt out could be driven by surpassing the threshold or other by other factors, such as the attractiveness of alternative tax systems. Additionaly, we cannot exclude firms that had a revenue decrease and could opt-in to Simples again, but chose not to. In this case, our estimates are a lower bound to the actual effect of the apprentice program on entry on the labor market.

The second assumption, limited anticipation, requires that firms cannot predict the treatment. That is, the treatment has no causal effect before its implementation. In our setting, although firms might know that they will exit simples next year, they are still not required to employ apprentices in the previous year. Because they work fewer hours than their CLT counterparts and have a more extensive set of rules, such as ECA and enrolling in vocational courses, which firms must ensure are being met, they are expected to refrain from hiring apprentices unless it becomes mandatory. However, this may not be true for other outcomes, such as hiring non-apprentices first-time workers, as firms can predict increases in taxes and decrease their hiring.

The third assumption, parallel trends, establishes that the control group can serve as a valid counterfactual for the analysis. This means that absent of the treatment, firms would have similar patterns in their outcomes. In our scenario, this means that early-treated firms and late-treated firms have similar hiring patterns for first-time workers before the hiring of apprentices starts to be mandatory. That is, firms near the revenue threshold would have similar hiring patterns before surpassing it, and absent of the treatment, they would have kept on similar trajectories, we show in Figures A.6,4.1 and 4.2 that it does seem to be the case. By relying on the parallel trends assumption, we can attribute the differences in hiring outcomes between the two groups to the effects of the hiring quota.

One limitation of our analysis stemming from the lack of revenue data is our inability to disentangle the effects of the exit of the simplified tax system and the Jovem Aprendiz program, which influence firm behavior in hiring. As a result, the interplay between these two variables may introduce confounding effects.

For instance, if the exit of Simples Nacional reduces the hiring of first-time workers and the Jovem Aprendiz program increases hiring, the relative magnitudes become critical for our analysis. Misinterpretation may occur if the magnitude of Simpels is larger, leading to an erroneous inference of a negative

effect of the apprenticeship program on the labor-market entrance. Conversely, if it has a smaller effect in magnitude, we would correctly observe the direction of the effect, however, it would be biased towards zero.

To address these concerns, we conduct a robustness analysis on the effect of exiting the Simples Nacional and Jovem Aprendiz programs on other educational groups. This analysis helps us assess whether the observed effects hold across different educational attainment levels. Nevertheless, we must acknowledge the potential heterogeneity of the impact of the simplified tax system for first-time workers with different educational backgrounds.

6
Results

This section presents our main results. First, we examine the consequences for firms when they exit the Simples Nacional, which serves as a proxy for changes in revenue level and the mandatory status of apprentice hiring. It is expected that firms may experience a decrease in the number of workers due to potential increases in taxes and associated costs. In figure 6.1, we show that after leaving the simplified tax system, firms decrease the number of non-apprentice employees workers by 1%. This could happen for two reasons, which we cannot disentangle. The first reason could be an increase in costs due to the change in tax systems, while the second reason could be the substitution between non-apprentice and apprentice workers.

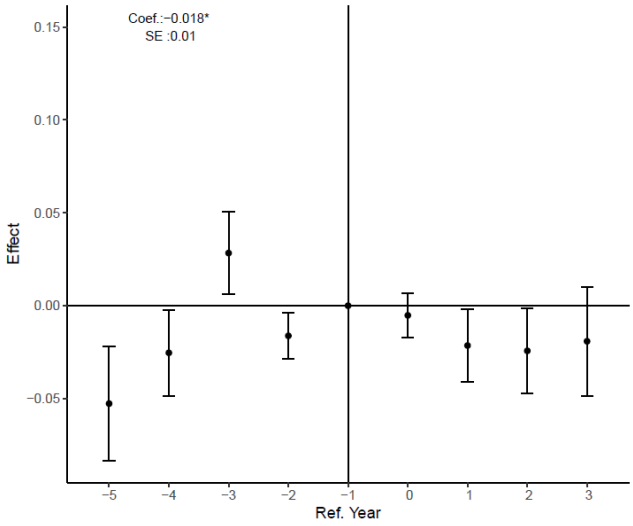


Figure 6.1: Effect of leaving SIMPLES on the number of workers

Note: This figure shows the event study of the treatment - leaving SIMPLES - on Log(Employees - Not apprentices). The reference year 0 is the first year the firms appear out of SIMPLES.

In figure 6.2 we show that after surpassing the threshold firms indeed increase the hiring of apprentices. This trend continues to grow in the subsequent periods, reaching 14 new apprentices for every 100 firms in the third period[1]. However, it is worth mentioning that this increase in apprenticeship

[1]We do not use a transformation on this data because there is zero values in our

hiring is not entirely expected, as there is a lack of compliance among firms despite the mandatory nature of the program.

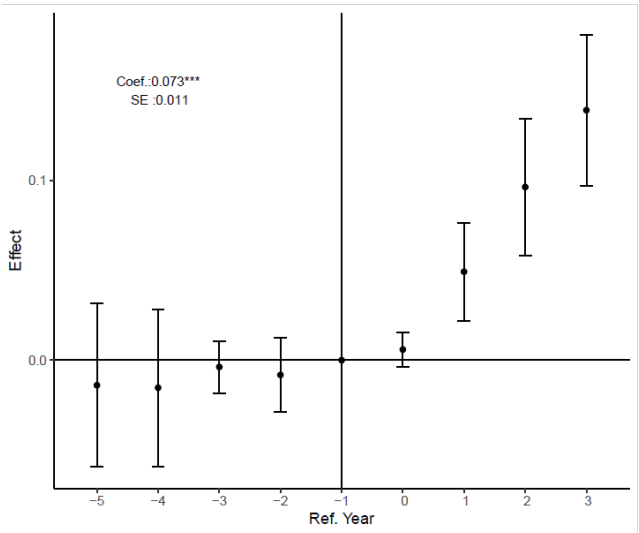


Figure 6.2: Effect of leaving SIMPLES on the hiring of apprentices

Note: This figure shows the event study of the treatment - leaving SIMPLES - on the total number of apprentices. The reference year 0 is the first year the firms appear out of SIMPLES.For reference see Table 6.1

The primary object of the apprenticeship program is to facilitate the entry of young individuals into the formal labor market. Consequently, the observed increase in apprentices would indicate an expansion of job opportunities if firms are increasing the number of first-time workers. However, if firms substitute first-time workers' entrance channels, the net effect would be zero. To investigate this, we look into the effect of surpassing the threshold on total first-time workers. Figure 6.3 shows the event study for the inverse hyperbolic sine transformation (IHS) of the count of first-time workers in the firm, encompassing both non-apprentice and apprentice workers. The findings show that the effect is not statistically different from zero, which points to a potential substitution in firms' hiring patterns.

As there is not an increase in entry, it implies that there should be a decrease in the recruitment of non-apprentice workers. Since apprenticeships are focused on individuals entering the job market and, who have not completed a high-school education, it is reasonable to expect that substitution within the same educational level. We test this hypothesis by looking at the number of new first-time workers that have not attained high-school level education

distribution, also, using the commonly used inverse hyperbolic sine would cause to the interpretation of the results not to be straightforward, as this would be a left-skewed distribution. This problem does not occur with the rest of the dependent variables, allowing us to use the distribution (Aihounton & Henningsen, 2020).

within each firm. In Figure 6.4 we present the results of the number of low-skilled first-time workers. There is an overall decline of 5% in this group's entry through non-apprentice contracts after the firm surpasses the threshold. This indicates the presence of a substitution effect among low-skilled first-time workers in terms of their entry channel. We must add that this effect can be partially driven by the exit of Simples Nacional.

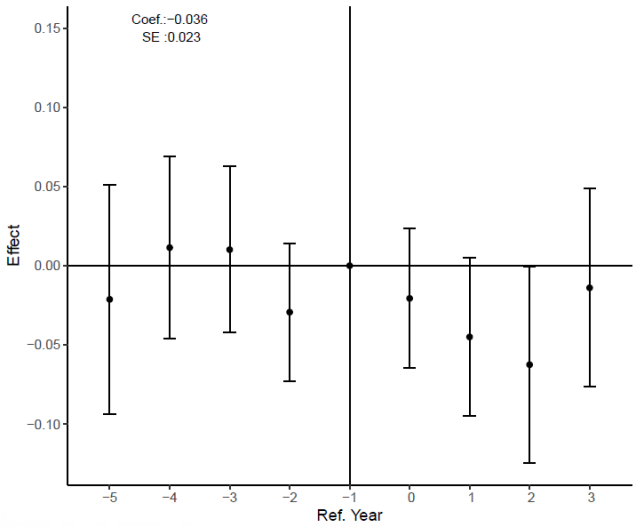


Figure 6.3: Effect of leaving SIMPLES on the hiring of First-time workers

Note: This figure shows the event study of the treatment - leaving SIMPLES - on the IHS(First time workers). The reference year 0 is the first year the firms appear out of SIMPLES.For reference see Table 6.1

To show the robustness of our results, we further investigate the effects of surpassing the threshold on the entry of first-time workers that completed high school and those with higher education. In Figures A.10 and A.11, we present the event study graphs depicting the effects the effect of leaving the Simples Nacional on the number of first-time workers with a high school diploma or that have completed higher education. Notably, both figures demonstrate no decrease in first-time non-apprentice workers from these groups following these firms' exit from the program. This evidence further supports our argument that there might be some substitution effect between the channel of entry of low-skilled workers proxied by their education level.

Table 6.1: Regression - Simples Exit

	Values in December 30th		*Flow of first time entrance*	
	Number of Apprentices	IHS(Workers)	IHS(First time workers)	IHS(First time appearance Less than HS Non-apprentice)
Panel A: Dynamic Impact				
Immediate ($t = 0$)	0.005	-0.005	-0.020	-0.045*
	(0.004)	(0.007)	(0.023)	(0.021)
Long run ($t = 3$)	0.139***	-0.019	0.013	-0.029
	(0.022)	(0.015)	(0.032)	(0.030))
Panel B:Aggregate Impact				
Post exit	0.072***	-0.017*	-0.035	-0.052**
	(0.012)	(0.009)	(0.025)	(0.023)
Sample size	51276	51276	51276	51276
Firm-establishment and Year FEs	Yes	Yes	Yes	Yes
Firms	4,273	4,273	4,273	4,273
Mean Dep. Var ($g - 1$)	0.01	3.94	1.53	0.95

Note: ***: Significant at 1% level;**: Significant at 5%; *: Significant at 10%. This table reports the establishment-level effects of the leaving Simples on employees outcomes: total number of apprentices, IHS of total number of workers, IHS for the first time that a worker appeared on RAIS, IHS for the first time that a worker with less than a high school diploma appeared on RAIS, IHS for the first time that a non-apprentice worker with less than a high school diploma appeared on RAIS. The mean of the dependent variable is calculated for the period before the simples exit.

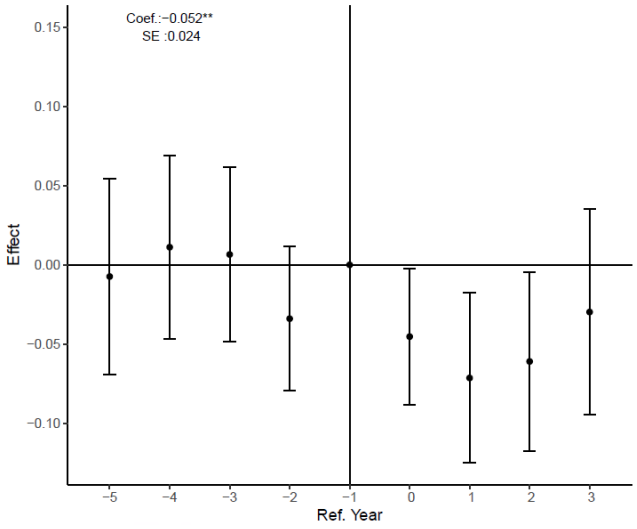


Figure 6.4: Event study - Non-apprentice First-time workers with less than a high school diploma

Note: This figure presents the event study of the dynamic effects of leaving Simples in transformation Inverse Hyperbolic Sine (IHS) the number of first-time workers with less than a high school diploma. We consider these workers that at the time of entry, had less than a high school diploma as their education status. Entrant workers appear for the first time in RAIS. Errors are clustered on the establishment level. The x-axis is the years before/after leaving the simples nacional. *Source: RAIS*

To understand the specific channel through which first-time workers who did not complete high school are being substituted by apprentice work, we analyze the most prevalent types of contracts used for initial hires in the formal

labor market: non-apprentices temporary and open-ended (CLT) contracts. In Figure 6.6, we show that the channel being replaced is an open-ended position, a CLT contract. This implies that those workers receive fewer contractual benefits than what they would receive in a non-apprentice open-ended contract.

However, it is important to note that we cannot determine which channel provides better long-term benefits. The apprenticeship contract might hold value, as it confirms a set of skills that might be transferable across multiple firms. Receiving a certificate at the end of the apprenticeship could enhance employability in the future (Alfonsi et al., 2020).

Additionally, in figure 6.5 we find no significant effect on the entry through temporary contacts, suggesting that no substitution occurs in this particular channel.

At last, we do a heterogeneity exercise on which regions would be most affected by this substitution Table B.3 shows the effects for the entrance of apprentices, number of workers, and number of first-time workers. We see that bar the North region, all see an increase of apprentices after the Simples exit. Also, there seems to be no decrease in the entrance of first-time workers in the firm. Nevertheless, all regions appear to have some degree of substitution. However, our results are driven mainly by the Northeast, where there is a significant drop of workers with less than a high school diploma that are not apprentices, followed by a substantial increase in apprentice workers.

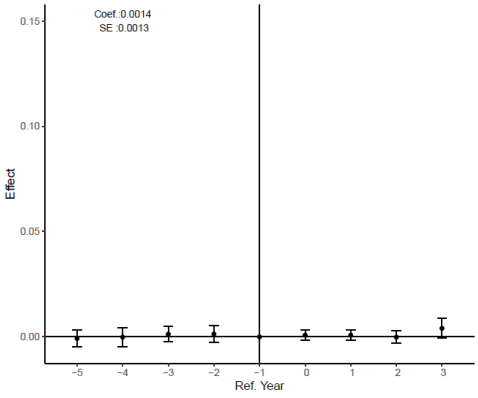


Figure 6.5: All entrants (Temporary)

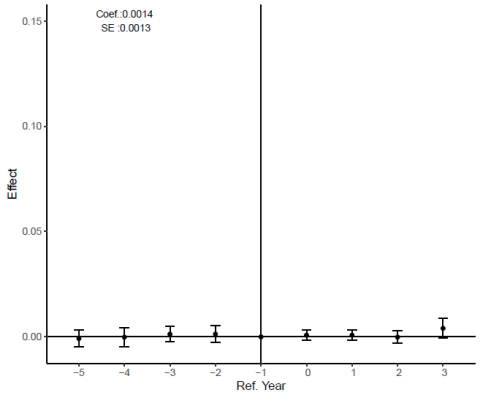


Figure 6.6: All entrants (CLT)

Event study - First-time workers (< High school) by the channel of entrance

Note: This figure presents the event study of the dynamic effects of leaving Simples in transformation Inverse Hyperbolic Sine (IHS) the number of first-time workers with less than a high school diploma by type of contract. We consider these workers that, at the time of entry, had less than a high school diploma as their education status. Entrant workers appear for the first time in RAIS. Errors are clustered on the establishment level. The x-axis is the years before/after leaving the simples nacional.For more information, see B.2. *Source: RAIS*

In summary, firms decrease their workers when exiting the Simples program and possibly turn into mid-sized firms. However, these firms start hiring more apprentices whilst reducing the number of low-skilled first-time workers, which points to some substitution in the type of entry between these workers and apprentices. Additionally, our findings indicate that firms are substituting the entry of workers with CLT contracts for apprenticeship contracts, despite the differences in the nature of these commitments.

6.1 Heterogeneity for minorities

We investigate the differential effects of the apprenticeship mandates on underrepresented minorities. In cases where there is taste-based discrimination (Becker, 1957), employers have a negative bias towards certain types of workers. The obligation to hire apprentices may increase the utility associated with hiring a lower quality of the preferred types. However, it also may increase the probability of hiring a first-time worker from the negatively perceived group. These effects may arise due to two mechanisms. First, a non-apprentice worker increases the number of apprentices the firm is required to employ and elevates the likelihood of facing penalties. Second, this mandate can alter the employer's choice set or lead to a different selection process, potentially decreasing the impact of network effects (Hsu Rocha & Dias, 2021; Miller & Schmutte, 2021). Consequently, the overall impact can either be positive or negative. Nonetheless, due to data limitations on workers' characteristics, we cannot assess the presence of discrimination.

Table 6.2 shows the impact on low-skilled workers, broken down by race and gender. We find larger decreases in the entry of first-time workers among male and nonwhite individuals without a high school degree. Notably, we find a 4% decrease in the entry for nonwhites without a high school degree in non-apprentice positions and a 6% decline for male entrants. In addition, we find that the point estimates for the entry of female and white individuals are not statistically significant.

We also investigate whether firms compensate for decreases in certain groups by increasing their hiring of individuals from those groups through apprenticeships. Table 6.2 shows that white and male individuals have the highest entry rates through apprenticeships. Whites experience an average increase of 0.07 new apprentices hired after the treatment, while males observe a rise of 0.06 apprentices per period. This stands a stark contrast with the result of a decrease in nonwhites' non-apprentices entrance, suggesting that there might be a change in racial hiring patterns.

Table 6.2: Heterogeneity by race and gender

	IHS(Nonwhite non apprentice (<High School))	Nonwhite Apprentices	IHS(White non-Apprentice (<High School))	White Apprentices	IHS(Male non-Apprentice (<High School))	Male Apprentices	IHS(Female non-Apprentice (<High School))	Female Apprentices
Aggregate Impact								
Post exit	-0.037**	0.037***	-0.030	0.073***	-0.059***	0.062***	-0.008	0.048***
	(0.016)	(0.007)	(0.022)	(0.007)	(0.021)	(0.005)	(0.018)	(0.008)
Sample size	51276	51276	51276	51276	51276	51276	51276	51276
Firm-establishment and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Firms	4,273	4,273	4,273	4,273	4,273	4,273	4,273	4,273
Mean Dep. Var ($g-1$)	0.397	0.014	0.718	0.009	0.685	0.013	0.450	0.011

Note: ***: Significant at 1% level;**: Significant at 5%; *: Significant at 10%. This table reports the establishment-level effects of the leaving Simples on employees outcomes, divided by rece and gender, all regressions are transformed using the inverse hyperbolic sine (IHS). All regressions are for the first time a worker of a group $c \in$ {Nonwhite,White,Male,Female} appeared in RAIS, for all entrants and all non-apprentice entrants, respectively. The mean of dependent variable is calculated for the period before the simples exit.

Nonetheless, these effects do not mean that this program negatively affects race entry, as we test only for a small subset of firms with similar characteristics, leaving a tax program made for small firms. The benefits for minorities could come from breaking a barrier of entry on larger firms and have a larger effect on future employment, as shown by Corseuil et al. (2019), where the effects of apprenticeship are larger on larger firms.

7
Determinants for apprentice hiring

We also study the determinants for apprentice hiring. A common reason for not complying with the apprenticeship program is the absence of apprenticeship courses in their municipalities (Corseuil et al., 2019), which results in out-of-pocket expenses for training. In table 7.1, we present the results demonstrating that the presence of a Senai or Sesc institution in the municipality more than doubles the number of apprentices hired. We remove firms in those municipalities to assess if this effect is driven by state capitals in our sample. Even after the exclusion, we still find a significant relationship between the availability of government-provided courses, which doubles the number of apprentices hired. This finding suggests that offering free training to firms reduces the cost per worker, enabling them to hire more apprentices, which aligns with existing literature (Caicedo et al., 2022).

Additionally, we explore whether a higher likelihood of facing fines influences firms' hiring decisions. Inspections conducted by the Ministry of Labor are a key enforcement mechanism to ensure compliance with hiring quotas (Szerman, 2022; Ponczek & Ulyssea, 2021). Given that we do not have access to data on firm-level inspection, we use proximity to a Ministry of Labor branch as a proxy for the probability of being inspected. We divide our sample into two subsamples based on the firms' proximity to a branch: one with a high probability of inspection (the closest department is below the median) and another with a low chance (distance above the median). We find no difference in the number of apprentices hired between these subsamples. This finding does not imply that inspections do not impact apprentice hiring. Instead, it suggests that the firms in our sample may be relatively small and have a low overall probability of inspection.

Table 7.1: Determinants of hiring

	Senai #Apprentices	No Senai #Apprentices	Senai (No capitals) #Apprentices	No Senai (No capitals) #Apprentices	High inspection #Apprentices	Low Inspection #Apprentices
Aggregate Impact						
Post exit	0.135***	0.065***	0.129***	0.065***	0.113***	0.104***
	(0.018)	(0.013)	(0.014)	(0.013)	(0.014)	(0.022)
Sample size	37427	20915	25451	20807	45887	12452
Firm-establishment and Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Firms	3,199	1,743	2,121	1,734	3,824	1,038
Mean Dep. Var $(g-1)$	0.029	0.014	0.019	0.014	0.026	0.015

Note: ***: Significant at 1% level;**: Significant at 5%; *: Significant at 10%. This table reports the establishment-level effects of the leaving Simples on apprentice hiring for different subsamples. *Senai* columns show the effects for firms that are located in a municipality that has an Senai location, which can provide free training for the apprentices, No Senai columns are those municipalities that do not have a SENAI branch, high inspection and low inspection municipalities are selected if they are above/below the median distance to a Ministry of labor police. The *no capitals* columns show the regressions excluding capitals from our sample. The mean of the dependent variable is calculated for the period before the simples exit. Post are all periods post simples exit. The control groups used is all the firms that are used for controls in previous regression

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Conclusion

In this paper, we investigate how labor quotas can affect entrance in the formal labor market. We do so in the context of Brazil, a country that has a huge apprenticeship program directed at youngsters between the ages of 14 through 23. We exploit the moment when firms exit a tax system exclusive for small-sized firms as a proxy for the firm changing sizes and assess if there is an increase in the entrance of apprentices and if affects entrances of other types of non-apprentice workers.

The main result of this paper shows that after leaving the tax program firms indeed increase the hiring of apprentices while decreasing the entrance of low-skilled workers, that is, those with less than a high-school education, without affecting the entrance of those with more education. There is also a larger effect of substitution of nonwhite workers, meaning that there might be a substitution between white and nonwhite workers and a substitution of those with CLT contracts. At last, we document the determinants of hiring these apprentices and show that firms hire more apprentices in municipalities where free training courses are provided by the government in comparison to those in municipalities where they have to pay out-of-pocket.

The welfare effects of our results are open for future work. On one hand, we observe that the substitution only comes from those workers with CLT contracts which in the short time could be worse for these workers, as they have a fixed-length contract and can be fired without receiving any compensation, and workers might attribute some intrinsic value to this type of contract. However, if the apprenticeship allows the worker to keep studying, as their contracts have less hours and also, at the end of the apprenticeship, they receive a certificate, which can improve future labor market outcomes. Hence, net welfare effects are unclear.

Finally, apprenticeship programs may have a higher effect on larger firms (Corseuil et al., 2019) and can break the barrier of entrance for minorities in these firms, and because these are firms with higher revenue, substitution may not occur. Also, breaking a barrier and entering in those firms with higher wage premiums may have persistent effects on minorities and also have positive externalities on the firm, creating a more diverse environment (Miller, 2017).

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A
Figures

Figure A.1: Localization of fixed units of SENAI (Serviço Nacional de Aprendizagem Industrial) in Brazil

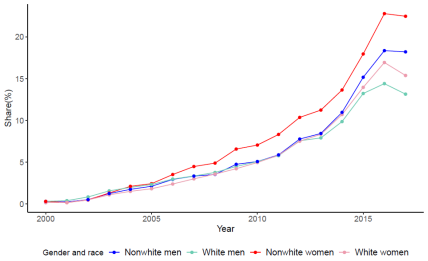

Figure A.2: All first-time workers

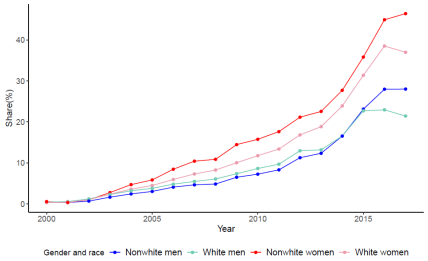

Figure A.3: First-time workers(< High school)

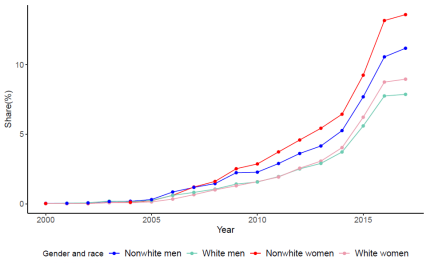

Figure A.4: First-time workers(High school)

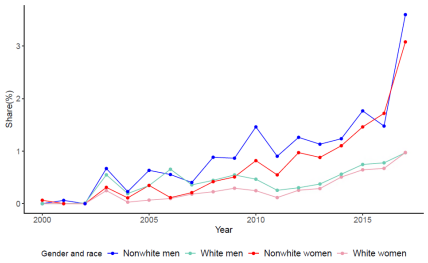

Figure A.5: First-time workers(> High school)

Share of young workers (<24 y.o.) who entered the formal labor market through an apprenticeship

Note: This figure shows the share of young workers (<24 y.o.) who entered the formal labor market through an apprenticeship. Figure A.2 shows the share of entrants regardless of schooling. Figure A.3 shows the share of entrants limiting for those with less than a high school education. Figure A.4 shows the share of entrants with a high school education, and A.5 shows the share of entrants with more than a high school education. We consider first-time workers those that get their first apparition in RAIS. *Source:* RAIS

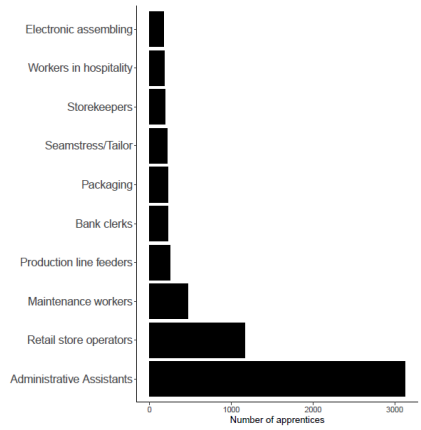

Figure A.7: Occupations (a)

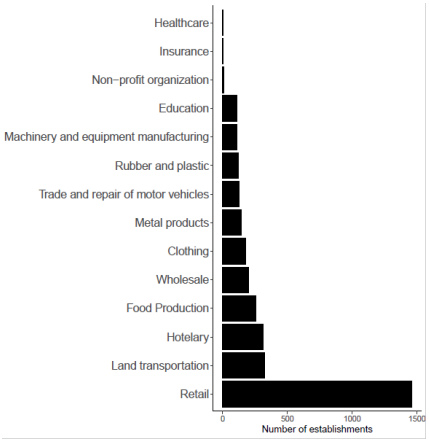

Figure A.8: Industries (b)

Figure A.9: Occupations and industries that apprentices are employed - Sample

Note: These figures present the occupations and industries that employ apprentices in our sample. Figure (a), shows the top 10 occupations apprentices enter, using the 4 digits occupation in CBO 2002. Figure (b) show the top 10 2 digit industries in CNAE. Apprentices here are those who have their first job as an apprentice. Therefore, each worker only appears once. *Source: RAIS*

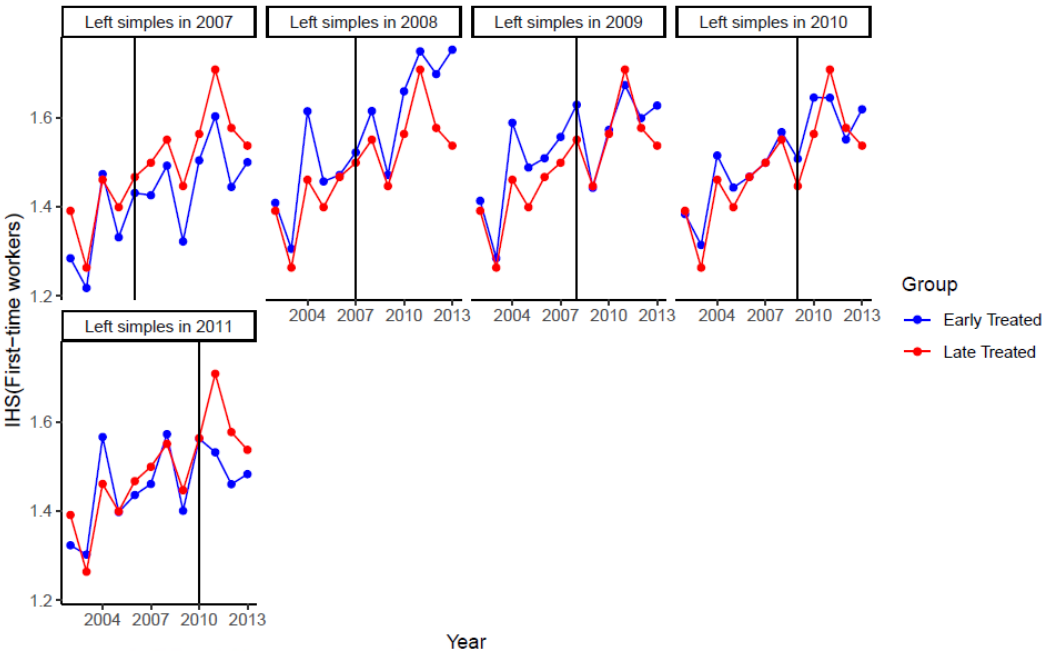

Figure A.6: Trends for IHS(First-time workers) between treated and late treated

Note: This figure presents the trends between the early-treated - shown by the blue line- and the late-treated establishments of the inverse hyperbolic sine of the number of yearly first-time workers that are employed by the firm, divided by the year of treatment of the early-treated establishments. The vertical line on each graph shows the period pre-treatment

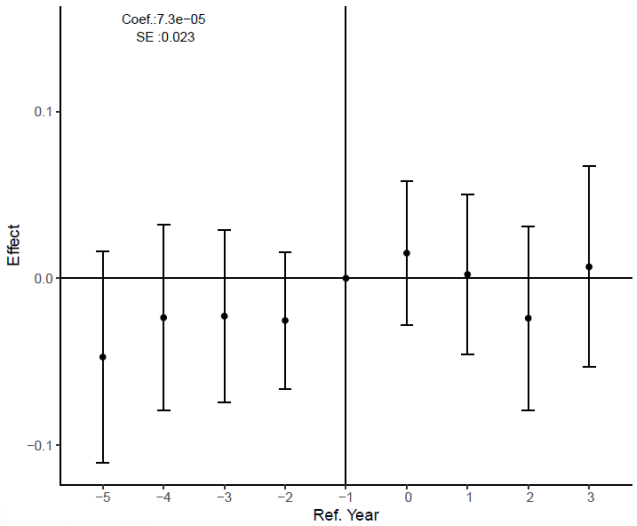

Figure A.10: Event study - First-time Non-apprentice workers with a high school diploma

Note: This figure presents the event study of the dynamic effects of leaving Simples in transformation Inverse Hyperbolic Sine (IHS) the number of first-time workers with a high school diploma. We consider these workers that at the time of entry, had a high school diploma but did not complete college or other training as their education status. Entrant workers appear for the first time in RAIS. Errors are clustered on the establishment level. The x-axis is the years before/after leaving the simples nacional. For more information, see B.2.*Source: RAIS*

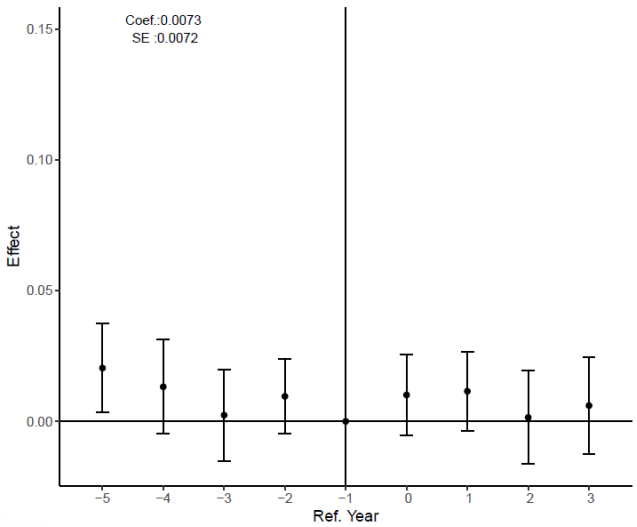

Figure A.11: Event study - First-time non-apprentice workers with more than a high school diploma

Note: This figure presents the event study of the dynamic effects of leaving Simples in transformation Inverse Hyperbolic Sine (IHS) the number of first-time workers with more than a high school diploma. We consider these workers that at the time of entry, had more than a high school diploma as their education status. Entrant workers appear for the first time in RAIS. Errors are clustered on the establishment level. The x-axis is the years before/after leaving the simples nacional. For more information, see B.2.*Source: RAIS*

B
Tables

Table B.1: Comparison between different contract types

	Open-ended CLT	Apprenticeship	Temporary
Maximum contract period	Indefinite	2 years (cannot be renewed)	6 months (can be renewed - maximum + 3 months)
Age group	>= 16 y.o.	14-23 y.o.	>= 16 y.o.
Daily hours	8 hours	8 hours (6 hours if did not complete high school)	8 hours
Paid Vacation	Yes	Yes	Yes
13th salary	Yes	Yes	Yes
Cost of termination	30-day early notice (or pay one wage) Fine of 40% of the value accumulated on FGTS	No costs	Payment of 1/12 of the total paid
Payroll taxes	INSS (Social Security) IRRJ (Income tax) FGTS (Severance Fund)-8% RAT (Social Security for work-related accidents) Sistema S	Same as open-ended contracts, however, with a decrease of 6 p.p. on FGTS payment	Same as open-ended CLT contracts

Note: Informations about the open-ended contracts were taken from *Consolidação das Leis do Trabalho*. For apprenticeship contracts, we used SINAIT (2019). And for temporary contracts, we used Law 6.019/74 and do not consider changes made in 2017, as our analysis is before these changes take place. The maximum contract period is the maximum time a contract of each type can have. Age groups are the minimums and maximum ages that a worker can be employed with each type of contract. Daily hours are the maximum hours, without overtime, each worker can have in their contract. Paid vacation is if the employee receives a wage in a leave. The cost of termination is the cost that the employer incurs in case of unfair dismissal. Payroll taxes are all the taxes that each contract incurs.

Table B.2: Robustness

	IHS(Temporary entrants)	IHS(CLT entrants)	IHS(Entrants (High School))	IHS(Entrants (>High School))
Aggregate Impact				
Post exit	-0.053**	0.001	$7e^{-5}$	0.007
	(0.026)	(0.001)	(0.021)	(0.007)
Sample size	51276	51276	51276	51276
Firm-establishment and Year FEs	Yes	Yes	Yes	Yes
Firms	4,273	4,273	4,273	4,273
Mean Dep. Var $(g-1)$	0.002	0.946	0.875	0.057

Note: ***: Significant at 1% level;**: Significant at 5%; *: Significant at 10%. This table reports the establishment-level effects of the leaving Simples on employees outcomes: inverse hyperbolic sine (IHS) of the number of first-time workers with temporary contracts, IHS of number of first-time workers with a CLT contract, IHS first-time worker which has high-school education, IHS for first-time workers with more than high school education. The mean of dependent variable is calculated for the period before the simples exit.

Table B.3: Regression - Simples Exit by region

	Values in 30th December		*Flow of first time entrance*		
	IHS(Apprentices)	IHS(Workers)	IHS(First time workers)	IHS(First time appearance Less than HS)	IHS(First time appearance Less than HS Non-apprentice)
Panel A: North					
Post exit	0.018	-0.057	-0.041	-0.066	-0.060
	(0.047)	(0.036)	(0.102)	(0.102)	(0.110)
Panel B:Northeast					
Post exit	0.082***	-0.014	-0.062	-0.084*	-0.154***
	(0.018)	(0.021)	(0.052)	(0.055)	(0.047)
Panel C:Southeast					
Post exit	0.045***	-0.016	-0.048*	-0.014	-0.048*
	(0.001)	(0.013)	(0.025)	(0.025)	(0.023)
Panel D:South					
Post exit	0.081***	0.007	0.048	0.051	0.021
	(0.010)	(0.017)	(0.041)	(0.037)	(0.038)
Panel E:Midwest					
Post exit	0.093***	-0.069 ***	0.051	0.058	-0.051
	(0.021)	(0.024)	(0.063)	(0.057)	(0.064)
Sample size	51276	51276	51276	51276	51276
Firm-establishment and Year FEs	Yes	Yes	Yes	Yes	Yes
Firms	4,273	4,273	4,273	4,273	4,273
Mean Dep. Var $(g-1)$	0.01	3.94	1.23	1.22	0.68

Note: ***: Significant at 1% level;**: Significant at 5%; *: Significant at 10%. This table reports the establishment-level effects of the leaving Simples on employees outcomes by region-subsamples: total number of apprentices, IHS of total number of workers, IHS for the first time that a worker appeared on RAIS, IHS for the first time that a worker with less than a high school diploma appeared on RAIS, IHS for the first time that a non-apprentice worker with less than a high school diploma appeared on RAIS. The mean of the dependent variable is calculated for the period before the simples exit. To be able to compare with the aggregated results we use the same control group for each regression.