Is Regulating Rest Time a Waste of Time? An Assessment of the Impacts of the "Rest Law" on Brazilian Truck Drivers[a]

Regular o tempo de descanso é uma perda de tempo? Uma avaliação dos impactos da "Lei do Descanso" sobre os caminhoneiros brasileiros

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Abstract: This paper aims to assess the impact of the Federal Law 12,619, known as the "Rest Law", on the monthly hours worked, wages, and non-fatal work accidents (injuries and illnesses) of Brazilian truck drivers. Therefore, we used a panel data by individuals built from information of the Annual Social Information Register (RAIS) from 2011 to 2014 and observed the natural experiment generated by the implementation of this Law in 2012, which provides the rules about the working hours and driving time of road passenger drivers and road cargo drivers (truck drivers) in Brazil to estimate a model of generalized difference in differences (GDD). The results show that the "Rest Law" did not generate statistically significant effects in any of the dimensions analyzed. Thus, we concluded that this Law does not seem to have achieved the objectives of its proponents and has not altered the decisions of truck drivers regarding the fulfillment of the daily work and rest hours stipulated by this

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new rule, meaning that the benefit of breaking the proposed legislation by assuming the risk of negligence seems to have been greater than its costs.

Keywords: Wages. Labor Accidents. Generalized Difference in Differences. Truck Drivers. Panel Data.

Resumo: O objetivo deste trabalho é avaliar o impacto da Lei Federal 12.619, conhecida como "Lei do Descanso", nas horas mensais trabalhadas, salários e acidentes de trabalho não fatais (lesões e doenças) dos caminhoneiros brasileiros. Para tanto, utilizou-se um painel de dados por indivíduos construído a partir de informações da Relação Anual de Informações Sociais (RAIS) de 2011 a 2014 e observou-se o experimento natural gerado pela implementação dessa Lei em 2012, que dispõe sobre a jornada de trabalho e o tempo de condução de motoristas rodoviários de passageiros e motoristas de carga rodoviária (caminhoneiros) no Brasil para estimar um modelo de diferença em diferenças generalizada (GDD). Os resultados mostram que a "Lei do Descanso" não gerou efeitos estatisticamente significativos em nenhuma das dimensões analisadas. Assim, concluímos que essa Lei não parece ter atingido os objetivos de seus proponentes e não alterou as decisões dos caminhoneiros quanto ao cumprimento das horas diárias de trabalho e descanso estipuladas por essa nova norma, significando que o benefício de infringir a legislação proposta ao assumir o risco de negligência parece ter sido maior do que seus custos.

Palavras-chave: Salário. Acidentes de Trabalho. Diferença em Diferenças Generalizadas. Caminhoneiros. Dados em Painel.

JEL: C23. K31. R41.

1. Introduction

Over the years, many studies have been developed seeking to analyze the trade-off between wages and the risk of accidents that workers face daily in the exercise of their work activities (Viscusi; Masterman, 2017). Thaler and Rosen (1976) point out that workers voluntarily accept many risks of death or injury that are not inherent in their daily lives because they do not know that they could have avoided them through the expense of their own resources. On the other hand, some workers choose to neglect such risks, motivated by the possibility of reassessing higher earnings from this choice.

The labor market can also be seen as the promoter of an implicit risk-trading mechanism (and other attributes) that can shift from one job to another. Dorman and Hagstrom (1998) argue that, in perfectly competitive markets, workers will receive a reward in their earnings that will compensate exactly for the utility of taking on greater risks of injury and death. Thus, some workers may expose themselves to even greater risks than the natural risks of their work activities to achieve higher earnings. This may be the case of truck drivers in Brazil who have their payment established per unit of kilometers traveled, considering an expected level of productivity (Chahad; Cacciamali, 2005). Hence, their payment is directly associated with the number of driven kilometers in the shortest possible time. This intense work rhythm results in greater physical-mental and emotional-affective strain, which impacts their health and causes numerous disturbances to the bodies of these workers, consequently affecting their quality of life (Masson; Monteiro, 2010). Such incentives significantly increase the risk of these workers getting involved in some sort of traffic accident in their work activity.

This situation of exposure to high risk of fatal or non-fatal accidents, enhanced by economic incentives in this activity, can be observed in some accident statistics in Brazil. According to the information on the Annual Social Information Register (RAIS) developed by the Ministry of Labor (2018), in 2011 eight out of every 100,000 workers in this field suffered fatal accidents while performing their activity. This average increased to 11 fatal accidents per 100,000 workers in 2012, and the total average among all sectors[1] of the economy was approximately two accidents of this type. It means that the risk of death in the exercise of the road driving activity is about five times higher than the risk of death from other labor activities in

[1] According to the National Classification of Economic Activities – CNAE.

Brazil. In the same year, seven injuries were recorded in the work environment per 1000 workers in the road transport sector (the average, in the same period, was approximately four accidents) and two diseases resulting from the performance of the activity per 1000 workers, making the sector one of the largest responsible for work accidents in the country, also burdening public and private health services.

Moreover, according to the Statistical Yearbook of Occupational Accidents (AEAT) published by the Secretariat of Social Security of the Ministry of Labor (2015), 9,142 typical work accidents were recorded in 2009 among Brazilian truck drivers in the exercise of their duties, representing 2.2% of the total work accidents registered in the country. In 2012, this total number increased to 10,058, accounting for 2.4% of the total typical accidents that occurred in the period. Regarding illness acquired at work in 2009, 248 incidences of absence from work were recorded for this reason, representing 1.3% of the total occurrence of illness recorded throughout the Brazilian labor market. In 2012, this total decreased to 212 among truck drivers, representing 1.2% of the total occurrence of illness in the period. These numbers place the activity among the top five responsible for occupational accidents in Brazil, only behind activities such as civil construction, hospital care, and public safety, for example (AEAT, 2015).

Considering these numbers that describe the risk of exercising the activity of a truck driver in Brazil and departing from a diagnosis that these derive from an overload of worked hours motivated by economic incentives, Federal Law 12.619 was created in 2012, which became known as the "Rest Law". According to Brazil (2017a), this Law relates to the exercise of the driver profession, aiming to regulate and discipline the working hours and driving time of the road driver worker. In other words, it was expected by its proponents that these changes would be able to alter the number of hours worked and the rest time of cargo and passenger road drivers in Brazil. This would decrease the number of injuries and illnesses related to this work activity, even though they resulted in an expected reduction in the remuneration of these drivers, since they began to have legal restrictions to supply their working hours.

However, such restrictions imposed by the Law did not reach all transportation workers. Professionals in maritime and air transport, and other road transport, who have not been affected by this new rule, allowed us to construct a control group. As Cohen and Dehejia (2004) mention, the change in regulation can

be treated as a large-scale natural experiment, which makes it possible to examine the effects of this legal change in different dimensions.

In this context, this paper aims to evaluate the impact of the Rest Law on the monthly hours worked of cargo and passenger road drivers, as well as on their wages and on the non-fatal work accidents (injury and illness). To identify the effects of this Law (treatment), based on the RAIS database from 2011 to 2014, models of generalized difference in differences are estimated considering the implementation of that law in 2013 (the beginning of its term was in September 2012, but due to the limitation of data, it is considered the treatment period from 2013).

As far as we know, only Lima (2018) empirically evaluates the effects of this law on the wages and on the working hours of these workers. However, the present study differs by using an identified database, which allows the construction of a panel data set, so that the estimated models have a control for unobserved heterogeneity. This would not be possible to achieve through estimates in which the individuals included in the sample, before and after treatment, are not the same. Moreover, it adds an important dimension to the possible consequences of that law, which are the traffic accidents at work.

Besides this introduction, the paper presents four more sections. In the next section is presented the literature that gives the theoretical basis of the estimated models is presented. In the following section, the identification strategy used to obtain the treatment effects, as well as the data, will be shown. In section four, the main results of the study will be presented, and after that, in the last section, some final considerations will be presented.

2. Literature review

According to Beek (2011), several studies have been conducted that assess the main causes of accidents among road drivers, especially freight drivers. Most of these studies focus on hours worked, fatigue, and sleep deprivation as causes of reduced alertness or sleep at the wheel by truck drivers as the main elements in the causes of traffic accidents and traffic deaths (Campbell, 1991; McCartt *et al.*, 2000; Häkkänen; Summala, 2001; Sabbagh-Ehrlich; Friedman; Richter, 2005; Bunn; Slavova; Robertson, 2013). In Brazil, this topic is widely studied in the health area (Souza; Paiva; Reimão, 2005; Masson; Monteiro, 2010; Knauth *et al.*, 2012; Oliveira *et al.*, 2016; Moraes *et al.*, 2019). In terms of economic analyses, the

research of Ferreira (2003), Chahad and Cacciamali (2005) and Lima (2018) stand out, although they are incipient.

Cohen and Dehejia (2004) emphasize that the incidence of motor vehicle accidents and traffic deaths is also influenced by the choices made by drivers, including careful driving, use of alcohol and illicit drugs, and the number of hours driving the vehicle. Age and driving experience are also related to accidents with truck drivers, as young, inexperienced, and less risk-averse drivers tend to be the main responsible of road accidents (Häkkänen; Summala, 2001). This idea is corroborated by the information survey conducted by Campbell (1991), which shows that the risk of an accident involving trucks increases significantly when the truck driver is under 30 years old.

McCartt *et al.* (2000) show that more than half of the truck drivers analyzed in their study confirm that they have already slept at the wheel while driving. Due to the size and weight of the trucks, they can result in serious injuries or even fatal road accidents. Furthermore, events like these involve truck drivers and other people, which significantly increases the costs of these accidents in terms of lives and health services.

Regarding fatigue, according to McCartt *et al.* (2000), driving has characteristics that necessarily lead to fatigue: it is monotonous, repetitive, and requires constant attention. Williamson, Feyer, and Friswell (1996) show that fatigue increases with the duration of the trip, regardless of the truck driver's workday. Wylie *et al.* (1996) add that one of the main factors influencing drivers' fatigue is the duration of the trip, plus the task and the number of accumulated trips. Furthermore, Häkkänen and Summala (2001) indicate that the probability of fatigue being the cause of an accident significantly increases when the driver already shows signs of fatigue while driving.

Long working hours are also associated with adverse health effects, such as cardiovascular disease, diabetes, disability retirement due to poor physical health, fatigue, and physiological changes in cardiovascular and immunological parameters (Beek, 2011). According to Häkkänen and Summala (2001), the occurrence of a past illness or accident generates a significant increase in the risk of an accident. In this sense, in a study conducted in the United States, Korelitz *et al.* (1993) showed that the development of health promotion programs for truck drivers generated positive effects for these workers in relation to the problems mentioned above.

McCartt *et al.* (2000) and Beek (2011) say that the most trivial measure to solve these problems would be to reduce the hours worked and, consequently, reduce the workload of truck drivers, which would improve healthy recovery after work and reduce the risk of accidents of traffic accidents. However, the main problem with this proposal is that both shipping companies and drivers benefit financially from long working hours, as the more hours worked, the greater the profits and remuneration (Beek, 2011).

Burks (1997) describes how the payment of truck drivers in Brazil is, with the amount received by these workers based on the mileage or on the combination of the fixed price of transport plus the mileage traveled to perform the service. As an alternative to alleviate these problems, Beek (2011) suggests that truck drivers could take shorter breaks, especially when they feel tired. In this regard, better cooperation between shipping companies and truck drivers could also help reduce the workload by encouraging shorter breaks. The author also suggests that the State could be stricter with those who violate the regulation of maximum consecutive hours at the wheel.

These legal measures to control working hours by truckers already exist in Europe and the United States. According to McCartt *et al.* (2000), federal hours of service regulations are the main tools used by the US Federal Highway Administration to promote safe travel by inter-industry drivers. This regulation contains points that should be highlighted, such as the determination that no truck driver can operate a motor vehicle while their capacity or vigilance is impaired, or possibly be incapacitated by fatigue. Furthermore, it stipulates that, except in limited circumstances, inter-industrial truck drivers cannot drive for more than 10 consecutive hours or work for more than 15 hours before having eight hours off. In this way, the driver can divide the eight hours off into two periods, as long as the truck has an adequate resting place. In the European Union, current regulations stipulate that the maximum driving time is 10 hours and rest time is at least 11 hours per 24-hour period (Häkkänen; Summala, 2001).

The Labor Courts in Brazil have faced the legal issue of the road truck driver's journey under the prism of Article 62, item I, of the Consolidation of Labor Laws (Brasil, 2018). Thus, the truck driver was hired by the shipping company as an outside worker and, therefore, did not have schedule control. According to Chahad and Cacciamali (2005), the truck drivers' labor relations were a consequence of the

proliferation of outsourced companies, which guaranteed the supply of labor and the provision of services to the final employer. It ended up covering a relationship of legal dependence, and it caused the displacement of the labor market of these workers, as well as a relative disorganization in the offer of the category. This is also because the class, in a situation of autonomy and independence, had difficulties in structuring unions. As a result, overtime was not paid and rest breaks were not regulated. The exception to this rule occurred in cases where, through labor action, it was possible to prove that the company was somehow able to control the truck driver's workday or through conventional instruments of the category, such as tachographs (Silva, 2012).

To limit the excessive working hours to which these professionals are exposed, as well as to reduce their incentives to opt for extreme situations (use of illicit drugs to be awaken, as an example) and aiming, mainly, to reduce the number of accidents of work in this sector, in 2012 Law 12,619 was created, which became known as the "Rest Law". This law deals with the exercise of the driver profession, aiming to regulate and discipline the working hours and driving time (Brazil, 2017a).

It established that drivers cannot work more than eight hours a day or 44 hours per week in fixed shifts and no more than 6 hours when on shift relay. It can only be changed by collective work agreements, which may provide for the compensation of hours or even the reduction of the workload (Silva, 2012). It is important to highlight that the Law also brought an important change related to liability. Drivers of motor vehicles whose driving requires professional training and who carry out the activity through work, in the following activities or economic categories, are subject to the sanctions of this law: road passenger transport and road freight transport (Brazil, 2017a).

This change in Law can be seen in several ways from an economic point of view. According to Cahuc, Carcillo and Zylberberg (2014), workers are encouraged to make an extra effort to obtain higher earnings. However, a change in social norms (Laws), which influence labor productivity and the equilibrium effort, can work as negative externalities to compromise the efficiency of the competitiveness mechanism. In other words, the control of working hours imposed by the new law on traffic drivers may have a negative impact on their income.

On the other hand, this new legislation can reduce the exposure to the risk of accidents at work that these workers suffer daily, since, with the rigidity of the

working day, drivers have more rest from one working day to another. In this way, the Rest Law could impact the risk exposure of these workers. As Rohlfs, Sullivan and Kniesner (2015) mentioned, a situation that causes an exogenous change in risk is a rule change (law, for example), which is expected to have changed drivers' incentives, encouraging them to be more prudent behind the wheel, and their conditions for carrying it out.

However, in item V of the 2nd Article in Law 12,619 (Brazil, 2017a) says that,

> The working hours and driving time are reliably controlled by the employer, who may use annotation in a logbook, stationery, or an external worksheet, pursuant to § 3 of art. 74 of the Consolidation of Labor Laws - CLT, approved by Decree-Law No. 5,452, of May 1, 1943, or of suitable electronic means installed in vehicles, at the employer's discretion.

The law establishes that the record of hours worked is kept by the driver and passed on to the employer, without any other monitoring mechanism for this information. Moreover, this law establishes that overtime and work modalities with differentiated hours can be negotiated between the driver and the employer through agreements or collective labor agreements. Given the lack of monitoring, the possibility for employers and drivers to record only information that is convenient to them is the most reliable scenario. Hertz (1988) and Braver *et al.* (1992) mentioned the fact that non-compliance with the number of driving hours is quite common among American truck drivers. According to Braver *et al.* (1992), most of these violations occurred for economic reasons. Although records show a reduction in working hours and, perhaps, in wages, the alleged negligence of compliance with the law can be captured by the work-related accident statistics. This new law is an important element with regard to the liability for accidents that falls on employers and drivers, who can change their decision-making, even if it presents compliance problems due to the high costs of inspection. Shavell (2003) stated that without strict liability for the claims, the potential cause of the injuries ("injurers"), here represented by drivers and shipping companies, would not have any care.

The results of this type of negligence are confirmed by Cohen and Dehejia (2004), who warn that limiting the liability of motor vehicle drivers through irreproachable liability laws leads to an increase in traffic deaths. Furthermore, the authors argue that, as a no-fault liability system limits drivers' liability for their actions, it also weakens their incentives to take precautions when driving.

However, under strict liability (with guilt), they should always pay for the damage caused in an accident (Shavell, 2005), which means that drivers and companies that exceed legal working hours, in addition to circumventing other issues provided for in the new law, are liable for this damage, something that was not previously present in Brazilian legislation. Additionally, Kolstad, Ulen, and Johnson (1990) and Shavell (2005) argue that the threat of action, on the other hand, can force adequate care from these agents, since precaution tends to reduce the risk of accidents, and this threat induces them to choose the socially optimal level of care. Thus, the driver will only be held responsible for accidental losses if he is negligent, if his level of care is lower than the so-called "due care", which in this case is represented by the number of hours worked and rest provided by this new rule. However, this care on the part of companies and drivers, while reducing the expected costs generated by accidents, is economically onerous for them (Shavell, 2005).

According to Shavell (2005), the activity level of drivers and companies is only its preventive cost, which is lower than the social cost, with the probability of accidents being one of these costs. However, an increase in this level of activity (which can be represented by the number of kilometers traveled) will result in a proportional increase in expected accident losses, given the level of service, also increasing its usefulness. Thus, the maximization of the drivers' utility results from their engagement in their activity minus the total social costs, which are the service costs plus the expected losses from accidents (Shavell, 2003).

Therefore, if the intentions of the proponents of this law are confirmed, it is expected that truck drivers will have reduced their daily working hours with the Rest Law, consequently reflecting a reduction in the monthly working hours. However, the reduction in working hours may have negatively impacted the gains of truck drivers, as well as non-fatal work accidents in this sector.To verify these hypotheses, the next section will present the identification strategy that will allow usto ratify or not these intentions.

3. Identification strategy

The difference in differences (DID) method has been widely used as an effective tool for evaluating public policies (Lee, 2016; Menezes-Filho; Pinto, 2017). The method consists of calculating a double subtraction, in which the first refers to

the difference in the means of the result variable between the periods before and after the treatment, for the treatment and control group, and the second difference refers to the difference of the first calculated difference between these two groups. Therefore, to make an estimate, it is necessary to have information from both groups before and after treatment.

In this paper, we analyze all Brazilian road freight and passenger drivers according to the impact of Law 12,619, of April 30, 2012, known as the "Rest Law". These workers are in the treatment group, being those who were exposed to changes established by the law. However, to determine the control group, as highlighted by Caliendo and Kopeinig (2008), the ideal situation would be to find professionals with the closest possible work characteristics of the workers who are in the treatment group to capture the real effect of the implementation of this law. This exercise has become more difficult to implement due to its full coverage for drivers on Brazilian highways, both cargo and passengers, and the consequent difficulty in finding the perfect match for these workers. An alternative solution to this problem would be the use of the *matching* technique, as used by Lima(2018), which consists of finding, in a large group of non-participants, those individuals who are similar to the participants in all relevant pre-treatment characteristics (Caliendo; Kopeinig, 2008; Almeida; Bravo-Ureta, 2017). However, its ability to generate ex-post pairs is questioned in the context of panel data, as there is no guarantee that these characteristics paired in a pre-treatment period will remain stable after treatment. To solve this problem, it was decided to build a control group with workers also from the transport sector, who are not affected by the Rest Law, who are basically represented by workers from the maritime and air transport segment, and other transport workers not covered by this new rule[2].

Menezes-Filho and Pinto (2017) said that a simple way to express the DID estimation method is from the calculation of a double difference of means of the outcome variable. Thus, let T = {1; 0} be the affected group (treated) or not (control) by the new law (treatment), and let t = {1;0} be the periods before and after the treatment. The DID estimator will be given by:

[2] The activities that are in the treatment and control groups are detailed in table A3 at the appendix, according to the CNAE.

$$\beta_{DID} = \{[Y|T = 1, t = 1] - [Y|T = 1, t = 0]\} - \{[Y|T = 0, t = 1] - [Y|T = 0, t = 0]\} \quad (1)$$

That is, due to the temporal difference of the effect that occurred with the treatment group, subtracted from the same difference calculated for the control group. Behind this procedure, there is the hypothesis that the temporal variation in the outcome variable for the control group represents the counterfactual variation of the treated group, meaning that the variation that would be experienced by the treatment group in the absence of the change in the law. So, generically, the average effect of this law on the variable Y of interest, for example, will be:

$$ATT = (Y_{1i} - Y_{0i}|D = 1) \quad (2)$$

In which:

ATT = Average treatment effect on treated;

Y_{1i} = Variable of interest i affected by the treatment;

Y_{0i} = Variable of interest i not affected by treatment (control);

$D = 1$: Belongs to the treatment group;

$D = 0$: Belongs to the control group.

It is worth reminding that, according to Lee (2016), the DID estimator depends essentially on the condition of no selection effect. On average, if treatment were maintained contrary to fact, the treatment and control groups would change by the same magnitude. However, this condition can be questioned if there is a discrepancy in the pre-treatment period, so that the responses between the two groups change differently in the pre-treatment periods (in case there is more than one pre-treatment period available for treatment). Under these conditions, if a gap in the pre-treatment period is found and it is believed to persist in the future, DID must be modified to a Generalized Differences in Differences (GDD) model, which is characterized by a DID with at least an additional difference in time, meaning that GDD requires at least three periods to be implemented (Lee, 2016). The main

benefit of GDD is that it allows the selection effect to be a constant over time that is not necessarily zero, because this constant is removed by the additional time difference using two pre-treatment periods.

GDD consists of an efficient way to estimate DID through panel data. The benefit of this strategy is that it enables the control of unobservable effects that are invariant in time, which, if not controlled, can negatively affect model residuals (Wooldridge, 2010). According to Angrist and Pischke (2009), the DID method with panel data is nothing more than a version of the estimation of the fixed effects model.

To evaluate the impact of the Rest Law on work conditions and non-fatal accidents (injury and illness)[33], four Generalized Difference in Differences (GDD) models will be estimated in a paneldata structure as follows:

$$\text{MHW}_{it} = \beta_0 + \beta_1 D_i . T_t + \alpha_i + \delta_t + u_{it} \quad (3)$$

$$ln\, w_{it} = \beta_0 + \beta_1 D_i . T_t + \alpha_i + \delta_t + u_{it} \quad (4)$$

$$Injury_{it} = \beta_0 + \beta_1 D_i . T_t + \alpha_i + \delta_t + u_{it} \quad (5)$$

$$Illness_{it} = \beta_0 + \beta_1 D_i . T_t + \alpha_i + \delta_t + u_{it} \quad (6)$$

In which MHW represents monthly hours worked, $ln\ w$ represents the logarithm of the worker's wages per hour, $Injury$ is a binary variable with a value of 1 if the worker suffers any injury in the work environment in the period, and $Illness$ is a binary variable with a value of 1 if the worker got work illness during the period. D is a binary variable that assumes 1 for the workers who are in the treatment group and 0 if they belong to the control group, T is the post-treatment period (considering 2013 and 2014). The subscript i indicates that the estimation is performed at the level of individuals, and the subscript t represents the period of time in which these individuals are observed in the sample. $D_i . T_t$ represents the worker who received

[3] Which was implemented in April 2012, as mentioned above.

the treatment of the law after its implementation, α_i is the controlof individual fixed effects, and δ_t refers to the control for fixed effects over time. u_{it} is the error term. Considering all these controls, the coefficient $_1$ will show the magnitude of the impact of the law inthe proposed situations.

In addition to this identification strategy, alternatives will be tested to assess the robustness of the results. The first strategy uses the differences in the characteristics of the activity between road passengers and freight drivers (truck drivers). According to resolution number 1971, of April 25, 2007, of the National Road Transport Agency - ANTT, in its Article 4, a control of working hours was already foreseen for road passenger drivers, as well as control of rest hours for them. Thus, it is possible that the Rest Law does not have a significant impact on these workers specifically. However, for truckers, there was no legal determination of this kind before this law, which means that it is likely that truck drivers are more sensitive to it.

Four situations will be tested so that the treatment and control groups will have different compositions in each of them. Table 1 presents these compositions.

Table 1 – Compositions of treatment and control groups

Groups	Treatment Group	Control Group
Group 1	Road passengers and freight drivers (truck drivers)	Maritime and air transport and road transport workers who have not been covered by this new law.
Group 2	Road freight drivers (truck drivers)	Road passenger drivers plus maritime and air transport workers, and road transport workers who have not been covered by this new law.
Group 3	Road freight drivers (truck drivers)	Maritime and air transport workers and road transport workers who have not been covered by this new law.
Group 4	Road freight drivers (truck drivers)	Taxi service, school transport, vehicle towing services, other activitiesauxiliary to land transport, courier services, express delivery services.

Source: Prepared by the authors.

The first GDD model will be estimated from the initial proposal (Group 1).

After that, it will be estimated having as the treatment group will consist only of truck drivers and road drivers of passengers participating, now, in the control group (Group 2). In the third situation, road drivers of passengers are excluded from the sample; they will not participate in either the treatment group or the control group (Group 3). In the last situation, it will be estimated having as the treatment group will consist only of truck drivers and service workers related to land transport not covered by the Rest Law, participating in the control group (Group 4). The purpose of these different arrangements is to analyze whether there is a specific effect of the Law on freight drivers.

The other robustness assessment strategy will be to change the treatment period. As it will be seen in the data description, the database used for this study comprises the years 2011 to 2014, with the years 2013 and 2014 referring to the post-treatment period. However, analyzing it in this way, the impact of the law would be the average of these two years on the outcome variable. Then, to analyze the effect of the law only in each year of its implementation (2013 and 2014), the GDD model will be modified and estimated as follows:

$$\text{MHW}_{it} = \beta_0 + \beta_1 D_i . 2013_t + \beta_2 D_i . 2014_t + \alpha_i + \delta_t + u_{it} \quad (7)$$

$$ln\, w_{it} = \beta_0 + \beta_1 D_i . 2013_t + \beta_2 D_i . 2014_t + \alpha_i + \delta_t + u_{it} \quad (8)$$

$$Injury_{it} = \beta_0 + \beta_1 D_i . 2013_t + \beta_2 D_i . 2014_t + \alpha_i + \delta_t + u_{it} \quad (9)$$

$$Illness_{it} = \beta_0 + \beta_1 D_i . 2013_t + \beta_2 D_i . 2014_t + \alpha_i + \delta_t + u_{it} \quad (10)$$

The objective of this alternative estimation is to verify whether the treatment had a significant heterogeneous effect in each year in which the law was implemented. This strategy will also be tested for the four compositions of treatment and control groups shown in Table 1. Thus, coefficients β_1 and β_2 will show the magnitude of the heterogeneous effects of the Rest Law in time.

Moreover, it is important to emphasize that when analyzing the effect of a federal law (as is the case), which covers all workers in the country in which the

impact is intended to be evaluated, and when controlling the fixed effects of workers, as mentioned above, two main problems of the methodology are solved: the problem of self-selection by treated units and the bias problem caused by omitted variables. These corrections are essential to ensure the robustness of the GDD estimator. The database used to carry out the proposed analysis is the Annual Social Information Register (RAIS) from 2011 to 2014, provided by the Ministry of Labor (MT). According to the MT (2018), this information aims to supply the needs of controlling labor activity in Brazil, providing data for the preparation of labor statistics, and making information on the formal labor market available to government entities.

The RAIS can also be obtained in an identified way, meaning that each period is informed of the CPFs (Individual Registration) of everyone who is in the base. This information allows us to build a panel database, because it lets us track individuals over time. Besides, this database differs from the others in that it informs the occurrence of work accidents involving individuals, allowing statistics related to these cases to be observed and monitored for each worker throughout their career.

As RAIS represents a formal employment population in the country, that is, it contains millions of observations, random samples were extracted both from the economic activities that are in the control group and from those that are in the treatment group for this study. This strategy is used because a sample with millions of pieces of information tends to generate models with type 1 errors, which find trend differences between groups when in fact they do not exist, compromising parallel trend tests, reducing the sample size, but still keeping a lot of information to be used to obtain the most robust analysis possible.

The outcome variables for the realization of the proposed estimates are presented in Table 2 together with their means and standard deviations. In this table, these statistics are described for the four arrangements of treatment and control groups as specified in Table 1.

Table 2 – Descriptive Statistics

Variables	GROUP 1					
	Control Group			Treatment Group		
	N	Average	S.D.	N	Average	S.D.
MHW	19.897	168,4281	19,2899	827	182,1794	8,9156
Wage/hour	19.885	26,5588	36,4837	767	8,4246	4,2360
Injury	154.712	0,0080	0,0893	6.580	0,0082	0,0902
Illness	154.712	0,0020	0,0442	6.580	0,0027	0,0522
	GROUP 2					
	Control Group			Treatment Group		
	N	Average	S.D.	N	Average	S.D.
MHW	20.966	168,1322	20,2021	382	184,2393	6,448685
Wage/hour	20.680	26,4061	36,1310	448	9,2983	5,7222
Injury	64.427	0,0078	0,0882	1.313	0,0152	0,1225
Illness	15.608	0,0040	0,0634	9.536	0,0025	0,0501
	GROUP 3					
	Control Group			Treatment Group		
	N	Average	S.D.	N	Average	S.D.
MHW	19.840	168,2909	20,30556	416	184,6788	1,8401
Wage/hour	20.205	24,9396	33,0170	427	8,5736	4,8934
Injury	63.366	0,0080	0,0889	1.206	0,0100	0,0993
Illness	11.240	0,0014	0,0377	40.252	0,0018	0,0420
	GROUP 4					
	Control Group			Treatment Group		
	N	Average	S.D.	N	Average	S.D.
MHW	2.512	178,0486	19,6116	26.432	184,1406	7,5950
Wage/hour	1.626	9,1982	13,0866	16.618	8,9694	6,1691
Injury	2.512	0,0135	0,1156	26.432	0,0095	0,0968
Illness	7.582	0,0021	0,0459	82.922	0,0020	0,0442

Source: own elaboration from RAIS data from 2011 to 2014 (MT, 2018).

The MHW variable refers to the average monthly hours worked by each worker each year. The "Wage/hour" is obtained by dividing the average nominal wage received by the worker by the hours worked per week 4.2 (based on a 30-day month divided by the seven days of the week).

The variables related to non-fatal accidents in the work environment (injury and illness) are constructed from the number of absences of the worker from the activity because of one of these reasons. In the RAIS, it says that each worker may have three absences in the year due to the occurrence of injury or illness resulting from the performance of the activity in the work environment. Thus, these variables are formed through the number of absences that the worker has had in the year, so that this sum will reflect a rate of injuries or illness in each period.

4. Results

As already highlighted, this study aims to evaluate whether the Rest Law had a significant impact on monthly hours worked, wages, and non-fatal accidents (injury and illness) at work. Thus, the results of the estimates of the GDD model for monthly hours worked will be presented in Table 3, including the four arrangements of treatment and control groups shown in Table 1. Next, we have the evaluation of the impact of this law on wages (Table 4), injuries (Table 5), and illness (Table 6) resulting from labor activity (non-fatal work accidents) for the same four arrangements described.

The results presented in Table 3 show that the "Rest Law" did not have a statistically significant impact on monthly hours worked in any of the treatment groups proposed in this study, both in mean and heterogeneous effects. It means that there is no evidence that the change in the rule had a significant effect on the control of the hours worked of these drivers. In the case of the truck drivers (Groups 2, 3, and 4), who are presumed to be more sensitive to this new law, there were also no significant impacts on monthly working hours.

Furthermore, to isolate all the effects that passenger road drivers could have on both the control and treatment groups, these workers were excluded from the sample, so that the treatment group was thus composed only of the truck drivers (Group 3). In the estimates for this group, there was also no significant impact of the Rest Law on the monthly hours worked by Brazilian truck drivers.

Table 3 – Effects of the Rest Law on monthly hours worked for the four arrangements of treatment and control groups in a model of generalized difference in differences - Treatment period: years 2013 and 2014

Variables	Group 1		Group 2		Group 3		Group 4	
				Mean effect				
$D_i \,.\, T_t$	0.578		0.152		-0.0197		-0.449	
	(0.665)		(0.650)		(0.325)		(0.443)	
				Heterogeneous effect				
$D_i \,.\, 2013_t$	0.561		-0.363		-0.138		-0.597	
	(0.609)		(0.958)		(0.250)		(0.437)	
$D_i \,.\, 2014_t$	0.595		0.615		0.0879		-0.301	
	(0.761)		(0.681)		(0.418)		(0.495)	
Constant	169.3***	169.3***	168.6***	168.6***	168.9***	168.9***	184.1***	184.0***
	(0.0775)	(0.0786)	(0.0787)	(0.0786)	(0.0843)	(0.0850)	(0.425)	(0.475)
Fixed-time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,724	20,724	21,348	21,348	20,256	20,256	28,944	28,944
Number of ID	5,181	5,181	5,337	5,337	5,064	5,064	7,236	7,236
R^2 within	0.00366	0.00366	0.00234	0.00239	0.00339	0.00339	0.000602	0.000683
R^2 between	0.0211	0.0211	0.0117	0.00866	0.0144	0.00851	0.0382	0.0383
R^2 overall	0.00159	0.00159	0.000347	0.000337	0.000329	0.000327	0.0113	0.0103

Source: Research results obtained from RAIS data (MT, 2018). Notes: Panel strongly balanced by individuals. Dependent variable: monthly hours worked. The outputs are results of the estimation of ordinary least squares with fixed effects estimator. The standard errors presented in parentheses are clustered by individuals and robust to heteroscedasticity. Statistical significance of estimates represented by: ***p<0.01, ** p<0.05, * p<0.1.

Table 4 presents the results of the estimates of the impact of the Rest Law on wages *(ln* Wage/hour) for the four arrangements of treatment and control groups proposed. The results did not show significant impacts of this law on wages for all the groups analyzed. This makes sense because, as there were no significant variations in monthly hours worked, it is expected that the same will occur with wages.

Table 4 – Effects of the Rest Law on wages for the four arrangements of treatment and control groups in a model of generalized difference in differences - Treatment period: years 2013 and 2014

Variables	Group 1		Group 2		Group 3		Group 4	
				Mean effect				
$D_i.T_t$	-0.00994		-0.00923		-0.0229		-0.0126	
	(0.0115)		(0.0300)		(0.0181)		(0.0117)	
				Heterogeneous effect				
$D_i.2013_t$	-0.00216		-0.00457		-0.0199		-0.00762	
	(0.0124)		(0.0285)		(0.0208)		(0.0115)	
$D_i.2014_t$	-0.0170		-0.0131		-0.0255		-0.0176	
	(0.0136)		(0.0355)		(0.0204)		(0.0131)	
Constant	2.914***	2.914***	2.921***	2.922***	2.895***	2.895***	2.268***	2.272***
	(0.00246)	(0.00249)	(0.00231)	(0.00233)	(0.00255)	(0.00256)	(0.0110)	(0.0122)
Fixed-time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,176	20,176	20,649	20,649	20,162	20,162	17,647	17,647
Number of ID	5,092	5,092	5,214	5,214	5,089	5,089	4,473	4,473
R^2 within	0.420	0.420	0.435	0.435	0.414	0.414	0.498	0.498
R^2 between	0.00333	0.00332	0.00333	0.00333	0.00133	0.00133	0.0127	0.0126
R^2 overall	0.0176	0.0176	0.0182	0.0182	0.0185	0.0185	0.0720	0.0720

Source: research results obtained from RAIS data (MT, 2018). Notes: Panel strongly balanced by individuals. Dependent variable: logarithm of the worker's wages per hour. The outputs are the results of the estimation of ordinary least squares with a fixed effects estimator. The standard errors presented in parentheses are clustered by individuals and robust to heteroscedasticity. Statistical significance of estimates represented by: ***p<0.01, ** p<0.05, * p<0.1.

The results presented so far show that the Rest Law did not have a significant impact on the monthly worked hours and on the salaries of road passengers and freight drivers, which, in a way, was already an expected result since those first years professionals already worked by a specific legislation to control the daily workload and rest (ANTT, 2007). However, it could be expected that this new rule would have a significant impact on the truck drivers, which was not proven according to the results presented here, since these show small coefficients and great variability.

Thus, this change in legislation may require a longer adaptation process amongthese workers, as although it is beneficial for their quality of life, for caring while driving and other situations involving health issues that are linked to the full

exercise of the activity, economic issues continue to generate incentives for the Law not to be complied with.

Thus, the control of working hours may have led truck drivers to neglect the new law to keep the average monthly wage unchanged. They likely maintained the same working day routine that they practiced under the law, by agreement with the companies or by their own decision, not to change profits and remunerations, since, as discussed above, there is no strict monitoring regarding this control of hours worked, which may have motivated these workers to neglect the new rule for the simple fact that they would not be punished for circumventing it.

These aspects indicate that even under strict liability for not fulfilling the number of daily hours worked established in the new law, truck drivers did not change, on average, their behavior inthis regard. However, it is plausible to assume that, even not comply with this rule, these professionals have at least increased their attention, care, and expertise behind the wheel to avoid traffic accidents. This happens because, knowing that causing or even getting involved in an accident, they could be responsible for the damage caused if they have not fulfilled the daily workload and rest provided for in the Rest Law. Table 5 presents the results of the estimates that assess whether the Rest Law had significant effects on the reduction of injuries resulting from the exercise of activity among truck drivers and drivers of passenger vehicles, based on the proposed methodological strategy.

The results show that there are no significant changes in the number of injuries after the implementation of the Rest Law. Only for the estimates for Group 2 is it possible to observe a small increase of less than 2 percent in the records of injuries of truck drivers in the work environment, but significant only at 10%, which suggests caution when using this result as evidence.

Table 5 – Effects of the Rest Law on injuries for the four arrangements of treatment and control groups in a model of generalized difference in differences - Treatment period: years 2013 and 2014

Variables	Group 1		Group 2		Group 3		Group 4	
				Mean effect				
$Di.Tt$	0.00286		0.0124*		0.00370		-0.00543	
	(0.00209)		(0.00634)		(0.00405)		(0.00405)	
				Heterogeneous effect				
$Di.2013t$	0.00185		0.00798		0.00659		-0.00491	
	(0.00231)		(0.00617)		(0.00581)		(0.00416)	
$Di.2014t$	0.00380		0.0162*		0.00119		-0.00595	
	(0.00272)		(0.00866)		(0.00621)		(0.00504)	
Constant	0.0110***	0.0109***	0.0114***	0.0113***	0.0109***	0.0109***	0.0178***	0.0183***
	(0.00034)	(0.00035)	(0.00055)	(0.00055)	(0.00053)	(0.00053)	(0.00386)	(0.00476)
Fixed-time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	161,292	161,292	65,740	65,740	64,572	64,572	28,944	28,944
Number of ID	40,323	40,323	16,435	16,435	16,143	16,143	7,236	7,236
R^2 within	0.00534	0.00535	0.00548	0.00552	0.00534	0.00535	0.00705	0.00705
R^2 between	2.18e-08	5.43e-08	0.000261	0.000274	2.78e-05	2.79e-05	0.000227	0.000227
R^2 overall	0.00271	0.00271	0.00298	0.00300	0.00272	0.00272	0.00353	0.00353

Source: research results obtained from RAIS data (MT, 2018). Notes: Panel strongly balanced by individuals. Dependent variable: binary variable with a value of 1 if the worker suffers any injury in the work environment in the period. The outputs are results of the estimation of ordinary least squares with fixed effects estimator. The standard errors presented in parentheses are clustered by individuals and robust to heteroscedasticity. Statistical significance of estimates represented by: ***p<0.01, ** p<0.05, * p<0.1.

Finally, Table 6 shows the results of the analysis of the impact of the Rest Law on work-related illnesses. For all Groups (1 to 4), no statistically significant changes were observed regarding this typeof non-fatal occupational accident. There is only a sign of reduction in the registration of work-related illnesses in 2014 for truck drivers in the analysis of Group 4; however, significant only at 10%. This result is linked to what had already been observed for the other variables of interest estimated for this group, confirming the initial suspicion that road passenger drivers could not be affected by the Rest Law because they are already covered by the 2007 law (ANTT, 2007).

Table 6 – Effects of the Rest Law on illness for the four arrangements of treatment and control groups in a model of generalized difference in differences - Treatment period: years 2013 and 2014

Variables	Group 1		Group 2		Group 3		Group 4	
				Mean effect				
$Di.Tt$	0.000214		-0.000486		-0.000628		-0.000335	
	(0.00106)		(0.000970)		(0.000747)		(0.000980)	
				Heterogeneous effect				
$Di.2013t$	0.000159		-0.000912		-0.000756		-0.000237	
	(0.00118)		(0.00117)		(0.00100)		(0.00109)	
$Di.2014t$	0.000265		-6.13e-05		-0.000500		-0.000434	
	(0.00113)		(0.00123)		(0.000948)		(0.00134)	
Constant	0.00272***	0.00272***	0.00416***	0.00400***	0.00274***	0.00264***	0.00322***	0.00332***
	(0.000197)	(0.000202)	(0.000585)	(0.000675)	(0.000625)	(0.000811)	(0.000934)	(0.00127)
Fixed-time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	161,292	161,292	25,144	25,144	51,492	51,492	90,504	90,504
Number of ID	40,323	40,323	6,286	6,286	12,873	12,873	22,626	22,626
R^2 within	0.00111	0.00111	0.00292	0.00293	0.00115	0.00116	0.00137	0.00137
R^2 between	3.21e-05	3.09e-05	0.000303	0.000218	2.44e-05	2.44e-05	5.45e-08	5.80e-08
R^2 overall	0.000686	0.000686	0.00127	0.00127	0.000550	0.000551	0.000676	0.000676

Source: research results obtained from RAIS data (MT, 2018). Notes: Panel strongly balanced by individuals. Dependent variable: binary variable with a value of 1 if the worker got work illness during the period. The outputs are the results of the estimation of ordinary least squares with a fixed effects estimator. The standard errors presented in parentheses are clustered by individuals and robust to heteroscedasticity. Statistical significance of estimates represented by: ***p<0.01, ** p<0.05, * p<0.1.

Considering all these results, it is possible to infer that the changes in the work and rest regime of truck drivers, as well as the responsibility for damages attributed to these workers who do not comply with the new rules, did not have the desired effect by their proponents in the case of the reduction of this type of work accident in Brazilian truck drivers. There is no evidence that the new regulation has had any kind of compliance by Brazilian truck drivers. For all variables of interest on this study no statistically significant effects were found, which raises the question of the real incentives generated by the Rest Law in changing the routine and habits of Brazilian truck drivers, which could directly interfere in their quality of life, as well as reduce the accidents they are involved in for not complying with the basic care

requirements that keep their expertise and attention behindthe wheel.

4.1 Robustness check

The parallel trend test is used to verify the robustness of the impact analysis of the Rest Law on the variables of interest for this job (monthly hours worked, wages, injuries, and illnesses), from the four proposed treatments and control group arrangements. This test consists of verifying whether there is a statistically significant linear relationship between those treated before and after treatment. Basically, any statistically significant estimate observed in the interaction of treated with previous periods and a period after treatment invalidates any inference about the variable of interest, since the premise of the DID method is that the variables of interest follow parallel trajectories before the treatment is interrupted. Although Lee (2016) emphasizes that the use of DID with at least two pre-treatment periods in a panel data structure solves the problem of non-parallel trajectories before the treatment, this test is used to guarantee the reliability of the analyses.

Table 7 shows that there is no statistically significant estimate of the interactions between treatment and periods on data for the four proposed treatment and control group arrangements on the monthly hours worked. These results confirm the robustness of the analyses carried out, which indicate the absence of impact of the Rest Law on the monthly hours of Brazilian truck drivers.

Table 7 – Parallel trend tests on monthly hours worked for the four arrangements of treatment and control groups in a model of generalized difference in differences

Variables	Group 1	Group 2	Group 3	Group 4
$Di.2011t$	-1.194	0.602	0.336	0.988
	(0.861)	(1.149)	(0.268)	(0.607)
$Di.2012t$	0.420	0.667	0.550	0.293
	(0.320)	(0.555)	(0.440)	(0.388)
$Di.2014t$	-0.0847	0.775	0.0533	0.290
	(0.355)	(1.033)	(0.223)	(0.294)
Constant	169.0***	168.5***	168.8***	183.6***
	(0.190)	(0.0824)	(0.0772)	(0.643)
Observations	20,724	21,348	20,256	28,944
Number of ID	5,181	5,337	5,064	7,236
R^2 within	0.00450	0.00279	0.00382	0.00126
R^2 between	0.0221	0.0129	0.0153	0.0379
R^2 overall	0.0180	0.00987	0.0106	0.0197

Source: Research results obtained from RAIS data (MT, 2018). Notes: Panel strongly balanced by individuals. The standard errors presented in parentheses are clustered by individuals and robust to heteroscedasticity. Statistical significance of estimates represented by: ***p<0.01, ** p<0.05, * p<0.1.

Table 8 shows that the analyses in relation to wages for all Groups are robust, which means that the workers who make up these control groups are good counterfactuals for truck drivers and passenger truck drivers (Group 1) and for truck drivers (Groups 2, 3, and 4). This ensures that there are no signs of statistically significant changes in the salaries of Brazilian truck drivers after the implementation of the Rest Law.

Table 8 - Parallel trend tests on wages for the four arrangements of treatment and control groups in a model of generalized difference in differences

Variables	Group 1	Group 2	Group 3	Group 4
$D_i \,.\, 2011_t$	-0.00105	0.0133	0.0223	0.0140
	(0.0166)	(0.0294)	(0.0222)	(0.0138)
$D_i \,.\, 2012_t$	-0.00763	0.000397	0.00342	0.00899
	(0.0109)	(0.0228)	(0.0170)	(0.0113)
$D_i \,.\, 2014_t$	-0.00962	-0.0101	-0.000487	-0.0108
	(0.0122)	(0.0236)	(0.0204)	(0.00776)
Constant	2.800***	2.801***	2.782***	2.111***
	(0.00245)	(0.00236)	(0.00205)	(0.0365)
Observations	20,176	20,649	20,162	17,647
Number of ID	5,092	5,214	5,089	4,473
R^2 within	0.421	0.435	0.415	0.498
R^2 between	0.0190	0.00187	0.00750	0.0222
R^2 overall	0.0229	0.0178	0.0207	0.0766

Source: research results obtained from RAIS data (MT, 2018). Notes: Panel strongly balanced by individuals. The standard errors presented in parentheses are clustered by individuals and robust to heteroscedasticity. Statistical significance of estimates represented by: ***p<0.01, ** p<0.05, * p<0.1.

Parallel trend tests on injuries (Table 9) for the four proposed groups indicate that no statistically significant linear relationships were found for interactions between treated and periods on data with this variable of interest. Thus, it is confirmed that the Rest Law did not generate significant changes in the registration of injuries in the work environment of Brazilian truck drivers.

Table 9 – Parallel trend tests on injuries for the four arrangements of treatment and control groups in a model of generalized difference in differences

Variables	Group 1	Group 2	Group 3	Group 4
$Di.2011t$	-0.00109	-0.00912	-0.00717	0.00799
	(0.00269)	(0.00788)	(0.00775)	(0.00561)
$Di.2012t$	-0.00229	-0.00630	-0.00734	0.00324
	(0.00256)	(0.00605)	(0.00501)	(0.00452)
$Di.2014t$	0.00186	0.00797	-0.00485	-0.00116
	(0.00285)	(0.00836)	(0.00905)	(0.00446)
Constant	0.0104***	0.0106***	0.0104***	0.00668
	(0.000376)	(0.000536)	(0.000461)	(0.00863)
Observations	161,292	65,740	64,572	28,944
Number of ID	40,323	16,435	16,143	7,236
R^2 within	0.00535	0.00553	0.00537	0.00718
R^2 between	6.70e-08	0.000271	2.85e-05	0.000367
R^2 overall	0.00266	0.00300	0.00258	0.00245

Source: research results obtained from RAIS data (MT, 2018). Notes: Panel strongly balanced by individuals. The standard errors presented in parentheses are clustered by individuals and robust to heteroscedasticity. Statistical significance of estimates represented by: ***p<0.01, ** p<0.05, * p<0.1.

The tests for occupational illnesses presented in Table 10 show that the analyses carried out for all Groups (1 to 4) are robust. Therefore, the results guarantee that the Rest Law was not effective in reducing work-related illnesses among truck drivers.

Table 10 - Parallel trend tests on illness for the four arrangements of treatment and control groups in a model of generalized difference in differences

Variables	Group 1	Group 2	Group 3	Group 4
$Di.2011t$	-0.000633	0.00208	0.000109	0.000140
	(0.00148)	(0.00168)	(0.00106)	(0.00126)
$Di.2012t$	0.000823	-0.000343	0.00143	-0.000187
	(0.00118)	(0.00127)	(0.00110)	(0.00131)
$Di.2014t$	-5.60e-05	0.000861	0.000254	-0.000163
	(0.000950)	(0.00142)	(0.00125)	(0.00145)
Constant	0.00271***	0.00551***	0.00265***	0.00649**
	(0.000242)	(0.000974)	(0.000718)	(0.00255)
Observations	161,292	25,144	51,492	90,504
Number of ID	40,323	6,286	12,873	22,626
R^2 within	0.00114	0.00306	0.00120	0.00142
R^2 between	2.06e-05	0.000250	2.07e-05	1.41e-08
R^2 overall	0.000543	0.00142	0.000611	0.000352

Source: Research results obtained from RAIS data (MT, 2018). Notes: Panel strongly balanced by individuals. The standard errors presented in parentheses are clustered by individuals and robust to heteroscedasticity. Statistical significance of estimates represented by: ***p<0.01, ** p<0.05, * p<0.1.

5. Final Considerations

The main objective of this study was to evaluate the impact of the Rest Law on the monthly hours worked, wages, and non-fatal accidents (injuries and illnesses) in the work of Brazilian truck drivers. Through a panel dataset, made from RAIS data from 2011 to 2014, GDD models were estimated to verify the existence of statistically significant effects of this new law on the variables of interest. The inferences about the impacts of the Rest Law in the analyzed dimensions proved to be consistent, since all samples and specifications were submitted to validity tests, so that it was possible to verify which estimates were robust.

Regarding the monthly hours worked and wages, no evidence was found that the Rest Law has had any statistically significant effect on these variables. It was an expected result, since the lack of inspection, combined with the financial discouragement that compliance would bring to truck drivers, already indicated that there were more reasons for not complying with the new rule. One of the reasons is that, by decreasing the monthly hours worked, it would probably also decrease the wages of these workers.

Therefore, the results obtained in this study show that truck drivers prefer not

to comply with the new rule, even with the possibility of objective liability for their non-compliance, especially in the case of involvement in accidents. The option of these professionals was likely to maintain their economic situation, even assuming a greater risk of punishment. In addition, it should also be highlighted, as relevant factors in this analysis, the fact that Brazilian truck drivers do not have adequate and safe places to be during the rest hours established by the new law, since there are high risks of cargo robbery when the truck is not moving. In this sense, not opting for rest may be related to participation in "convoys" of trucks to prevent robberies both at rest places and on roads.

Regarding non-fatal work accidents, it was expected that the Rest Law would encourage careful driving, as well as attention to the health of truck drivers, as long as if they exceeded the daily workload and did not comply with the daily rest period after the trip, and in case of involvement in accidents, it would be possible to detect these violations via a tachograph or even a logbook, so that strict liability for the damage would automatically apply to these professionals. Even in this context, the results did not detect any statistically significant effect on the improvement of health conditions, as measured by absence from work due to injury or illness. It was found that the average Brazilian truck driver did not change their behavior, nor did they comply with the requirements of the Rest Law. The result is not surprising, considering the low average wages of these workers, which motivates them to undertake exhausting journeys, with little or no rest, to maintain a subsistence-level financial condition.

However, it is important to emphasize that the only way for these truck drivers to be induced to practice the optimum level of their activity is to support losses resulting from accidents, which runs the risk of being held responsible for non-compliance with the law. According to Shavell (2003), under strict liability, the utility of drivers and companies deducted from expected costs will be equal to the measure of social well-being, since they will pay for the damage caused by the accidents they cause and, of course, will enjoy the benefits of engaging in their activity, supporting the costs of care, that is, they will choose the optimal level of care and the optimal level of their activity. It is also noteworthy that changes in responsibility depend on the Justice System and can take a long time to generate impacts. Although they could have some deterrent effect that anticipated their effect, in this study, it was not possible to observe this possible change in driver behavior.

This study analyzes formal workers, whose work regime is governed by the Consolidation of Labor Laws (CLT) in Brazil, and the results obtained here promote an important reflection on the incentives generated by Brazilian labor laws. It was found that the Rest Law is just another rule that is designed without carefully analyzing the possible economic impacts that it can generate. A possible alternative to verify the effects of the Rest Law would be to extend the treatment period. However, in 2015, this law was replaced by the "Truck Driver Law", which basically changes the main provisions of the Rest Law. So, this fact made it impossible to increase the treatment period, since this would be another effect on the treatment and would violate the premises of the DID method.

Future research agendas can provide the same analysis performed in this study to verify whether this 2015 law was able to generate some impact on the working conditions of these Brazilian workers. Moreover, an analysis differentiating employed truck drivers from self-employed workers could give greater robustness to the results obtained under the hypotheses proposed in this study.

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Appendix

Sample definitions

Table A1 - Description of the economic activities that are in the Treatment and Control Groupsaccording to CNAE

Treatment Group	
Code. CNAE	**Activity description**
4921301	Public Road Passengers Transport, with Fixed Itinerary, Municipal
4921302	Public Road Passengers Transport, with Fixed Itinerary, Intermunicipal in the Metropolitan Region
4922101	Public Road Passengers Transport, with Fixed Itinerary, Intermunicipal, Except in the Metropolitan Region
4922102	Public Road Passengers Transport, with Fixed Itinerary, Interstate
4922103	Public Road Passengers Transport, with Fixed Itinerary, International
4929901	Public Passenger Road Transport, Under Chartering Regime, Municipal
4929902	Public Passenger Road Transport, Under Chartering, Intermunicipal, Interstate, and International
4929999	Other Road Passengers Transport Not Previously Specified
4930201	Road Freight Transport, Except Dangerous Goods and Changes, Municipal
4930202	Road Freight Transport, Except Dangerous Goods and Changes, Intermunicipal, Interstate, and International
4930203	Road Transport of Dangerous Goods
4930204	Road Transport of Change

CONTROL GROUP	
Code. CNAE	**Activity description**
4923001	Taxi Service
4924800	School Transportation
5011401	Cabotage Maritime Transport - Cargo
5011402	Cabotage Maritime Transport - Passengers
5012201	Long-Haul Maritime Transport - Cargo
5012202	Long-Haul Maritime Transport - Passengers
5021101	Transportation by Cargo Interior Navigation, Municipal, Except Crossing
5021102	Transportation by Inland Cargo Navigation, Intermunicipal, Interstate, and International, Except Crossing
5022001	Transportation by Inland Navigation of Passengers on Regular Lines, Municipal, Except Crossing
5022002	Transportation by Inland Navigation of Passengers on Regular, Intermunicipal, Interstate, and International Lines, Except Crossing
5030101	Maritime Support Navigation
5030102	Port Support Navigation

5091201	Transport by Crossing Navigation, Municipal
5091202	Transport by Crossing Navigation, Intermunicipal
5099801	Waterway Transportation for Sightseeing Tours
5099899	Other Waterway Transport Not Previously Specified
5111100	Regular Passengers Air Transport
5112901	Air Taxi Service and Crew aircraft rental
5112999	Other Non-Scheduled Passengers Air Transport Services
5120000	Air Cargo Transport
5229002	Vehicle Towing Services
5229099	Other Land Transport Auxiliary Activities Not Previously Specified
5320201	Delivery Services Not Performed by The National Mail
5320202	Fast Delivery Services

Source: prepared by the authors.