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# Revisiting excess commuting and self-employment: The case of Latin America\*

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## Abstract

This paper analyzes the commuting behavior of employee and self-employed workers in urban areas of eleven Latin American countries, within a theoretical framework that identifies employees' excess commuting as different from self-employed workers' commuting. Using data from the ECAF data, results show that employees spend about 8.2 more minutes commuting to work than their self-employed counterparts, net of observable characteristics, a difference of around 18.5% of the employees' commuting time. This difference is qualitatively robust across the eleven countries and is concentrated in commutes by public transit, but it is not explained by differences in access to public transit services between the two groups. This analysis is a first exploration of self-employed and employee workers' commuting time in Latin American countries. By analyzing differences in commuting time between these two groups of Latin American workers, our analysis may serve to guide future planning programs.

*Keywords:* commuting time; self-employment; Latin America; ECAF data.

*JEL codes:* R40, O57.

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## 1. Introduction

This paper analyzes differences in the commuting behavior of employee and self-employed workers in eleven Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Panama, Peru, Uruguay and Venezuela), within a theoretical framework that models commuting for the two groups of workers (van Ommeren and van der Straaten, 2008). Millions of workers spend time travelling to/from work on their working days. Recent research has found that commuting is linked to negative consequences for workers, such as decreased health (Hansson et al., 2011; Kunn-Nelen, 2016), increased stress (Frey and Stutzer, 2008; Gottholmseder et al., 2009; Wener and Evans, 2011) and lower productivity (Ross and Zenou, 2008; Van Ommeren and Gutiérrez-i-Puigarnau, 2011; Grinza and Rycx, 2020, Gimenez-Nadal et al., 2022), and it has environmental impacts via traffic congestion and greenhouse gas emissions (Coria and Zhang, 2017; Liu et al., 2019; Gimenez-Nadal and Molina, 2019; Vosough et al., 2022).

Given the importance of commuting in the environment and the economies of countries, the analysis of commuting behavior is important for the correct design of mobility policies, which include pricing schemes and planning of infrastructures, among others (Gimenez-Nadal et al., 2022). However, this analysis has mostly been done in developed countries, including Europe, Australia, and the United States, but less work has been done in Latin America, perhaps because of a lack of data that allows for a comparative analysis across countries in this region. Within this framework, we analyze the commuting behavior of workers in eleven countries of Latin America. In doing so, we compare employed and self-employed workers, following van Ommeren and van der Straaten (2008) who compare these two groups of workers. According to their theoretical framework, differences in commuting between employed and self-employed workers are driven by imperfections in search behaviors for jobs and for workplaces; that is to say, by the extent to which it is easier or more difficult for employees to find a job, compared to the ability of self-employed workers to find a workplace where they can establish a business. If finding a suitable workplace is relatively easy for the self-employed, but finding a job is harder for unemployed workers, then the difference in commuting time/distance between the two groups of workers represents employees' excess commuting driven by job search imperfections.

Within this framework, we focus on the commuting behavior of employee and self-employed workers in Latin America, and potential differences between these groups of workers. We use data

from the ECAF survey of the *Banco de Desarrollo de América Latina*, and our empirical analysis resembles that of Gimenez-Nadal et al. (2018, 2020). First, we find that, contrarily to what happens in developed countries, commuting times seem not to have increased during recent years, remaining instead relatively stable. Second, we report a highly significant and quantitatively relevant difference in commuting time of employees and self-employed workers of about 8.2 minutes per commuting trip. This difference suggests that 18.5% of employees' commuting to work time is excess commuting, quantitatively close to similar estimates for the US (Gimenez-Nadal et al., 2018) and Europe (Albert et al., 2019; Gimenez-Nadal et al., 2020). We also find that the difference is highly significant for each country in the sample, despite finding some quantitative differences among countries, and is mostly concentrated among workers who commute via public transit, which is the preferred means of commuting to work in the analyzed countries. Furthermore, the extent of access to public transit services does not seem to explain the difference in commuting time between employees and self-employed workers.

The main contributions of the paper are threefold. First, we provide the first comparative study of commuting behaviors in Latin American countries, in a multi-country setting. To date, most of the cross-country analyses of commuting behaviors have focused on developed economies (Gimenez-Nadal et al., 2022), and developing countries remain less well studied. Cross-country comparisons allow us to analyze whether a given fact is the general norm, or if there are exceptions and why. Second, we analyze differences between employees and self-employed workers' commuting behaviors, complementing existing results for developing countries (van Ommeren and van der Straaten, 2008; Gimenez-Nadal et al., 2018, 2020; Albert et al., 2019). Our analysis is the first to analyse commuting and self-employment in Latin American countries. Third, we explore a potential channel that may explain differences in the commuting time of employees and self-employed workers, complementing prior studies that have not deeply explored potential channels. We find that access to public transit services does not explain the differences between employees and self-employed workers.

The remainder of the paper is structured as follows. Section 2 describes the theoretical framework developed by van Ommeren and van der Straaten (2008) to study commuting behaviors of self-employed and employee workers. Section 3 shows the data used throughout the analysis, and summary statistics of the data. Section 4 describes the empirical strategy and the main results. Finally, Section 5 concludes.

## 2. Conceptual framework

A particular concept of commuting that has received attention is that of “excess” or “wasteful” commuting. This concept was first proposed by Hamilton (1982), who analyzed optimal commuting flows in the US and concluded that about 90% of commuting trips could be considered wasteful, or excess commuting. Specifically, the term “excess commuting” refers to the difference between actual commuting trips, and optimal commuting trips. White (1988) revisited excess commuting in the US, and concluded that only 10% of actual commutes were excess commuting. More recently, other authors have studied excess commuting in a number of scenarios and techniques, summarized chronologically by Ma and Banister (2006) and Kim and Horner (2021).<sup>1</sup> One such scenario is that of Van Ommeren and van der Straaten (2008), who model the commuting behavior of employed and self-employed workers as a way to analyze excess commuting. Prior research has studied differences in the commuting behavior of self-employed and employee workers, but these studies have exclusively focused on the Netherlands (van Ommeren and van der Straaten, 2008), the US (Gimenez-Nadal et al., 2018), Spain (Alberto et al., 2019), and a pool of European countries (Gimenez-Nadal et al., 2020).

Van Ommeren and van der Straaten (2008) assume that all jobs are identical and pay the same exogenous wage  $w$ . For a given employee, jobs only differ in the distance to the employee’s residence location  $t$ , and thus in commuting cost  $\eta t$ , with  $\eta$  representing the exogenous cost per unit of commuting (Manning, 2003; van Ommeren and van der Straaten, 2008). Residence locations do not change, and employee workers can be either unemployed, or employed, with the unemployed receiving job offers at rate  $\lambda$ . For a given distance  $t$ ,  $F(t)$  represents the proportion of job vacancies at distance not greater than  $t$ . In this context, the unemployed accept all job offers within a maximum commuting distance  $T$ . On the other hand, employees become unemployed at an exogenous rate  $\delta$ . If  $b$  represents exogenous unemployment benefit, and  $r$  is the discount rate of future income, then the maximum commuting distance that unemployed workers accept job offers can be expressed as  $T = \frac{w-b}{\eta} - \frac{\lambda}{r+\delta} \int_0^T F(x)dx$ . One implication of this derivation is that the maximum acceptable

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<sup>1</sup> Kanaroglou et al. (2015) provide a comprehensive review of the concepts and policy implications of excess commuting.

commuting  $T$  decreases when the rate of job offers  $\lambda$  increases. In this setting, employees' commuting is  $0 < t < T$ .<sup>2</sup>

Furthermore, self-employed workers do not search for job offers, but for workplaces to establish their business. Thus, self-employed workers have two states, one in which they do not have a suitable workplace (equivalent to being unemployed for employee workers), and another in which they do have a suitable workplace. Furthermore, the model accounts for the fact that many self-employed workers may work from home, which generates an exogenous utility  $V_H$ . The main difference between employees and self-employed workers arises from the arrival rate of suitable workplaces, which differs with respect to the arrival rate of job offers of employees. Because  $T$  decreases when  $\lambda$  increases, if the arrival rate of workplaces among the self-employed is higher than the arrival rate of job offers among employees, then the self-employed will commute shorter distances.

Recent papers have found that arrival rates of job offer among employees are lower than arrival rates of workplaces among the self-employed, in developed countries such as France, the Netherlands, and the US (van den Berg and Ridder, 1998; Cahuc et al., 2006; van Ommeren and van der Straaten, 2008). These results are in line with empirical analyses of commuting and self-employment in developed economies by Gimenez-Nadal et al. (2018, 2020), Albert et al. (2019), Shin (2019), and Reuschke and Houston (2020), who found that the self-employed spend less time commuting than do similar employees in the US and in European countries. Furthermore, if the arrival rate of workplaces among the self-employed is perfect or almost perfect (i.e., very high), then the self-employed excess commuting is zero (van Ommeren and van der Straaten, 2008), and differences between the self-employed and employees represent the excess commuting faced by the latter.

The model of van Ommeren and van der Straaten (2008) then assumes that employees and self-employed workers differ only in their search behavior, and such a difference causes different commuting behaviors. Furthermore, assuming that the ability of the self-employed to find a suitable workplace is sufficiently high, relative to a limited arrival rate of job offers faced by employees because of imperfect information in the job-search market, then differences between employees and self-employed represent the amount of excess commuting faced by employees. So far, the empirical

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<sup>2</sup> See details in van Ommeren and van der Straaten (2008). The authors also provide several discussions on extensions of the model, such as different assumptions on employment density  $F(t)$  or the impact of specialization (e.g., the maximum acceptable commuting may be higher for highly educated workers who search for very specific jobs), finite mobility costs, or differences between urban and rural areas.

evidence has pointed to this result, but to the best of our knowledge such evidence has been limited to developed countries, i.e., the US (Gimenez-Nadal et al., 2018; Shin, 2019; Reuschke and Houston, 2020) and European economies (van Ommeren and van der Straaten, 2008; Albert et al., 2019; Gimenez-Nadal et al., 2020).

The case of developing economies, and in particular in Latin American countries, remains unexplored. However, it is relevant to study these countries. On the one hand, self-employment rates are much higher in developing economies than in developed countries (Campaña et al., 2018). On the other hand, commuting behaviors strongly depend on commuting mode, and the preferred mode of commuting in developed countries is the private vehicle (Gimenez-Nadal et al., 2021), especially among high- and middle-income households (Lucas, 2012). Thus, workers in Latin American countries and other developing countries, with lower levels of income, may make more use of other means of transport, such as public transit or active modes, and access to such services may affect workers' commuting behaviors (Useche et al., 2021).

### 3. Data and variables

We use data from the ECAF survey, conducted by the *Corporación Andina de Fomento* and the *Banco de Desarrollo de América Latina*.<sup>3</sup> The ECAF data is a series of annual cross-sections, conducted every year since 2008 in the main cities of several Latin American countries. The survey focuses on the sociodemographic conditions of the surveyed households and individuals, with different modules that are common across the survey years, along with specific information about the access, quality, and satisfaction with transport infrastructures. The survey also includes some special modules that are carried out on specific waves. The ECAF data covers the following countries: Argentina (the cities of Buenos Aires, Córdoba and Rafaela), Bolivia (La Paz, Santa Cruz and Cochabamba), Brazil (San Pablo, Fortaleza, Río de Janeiro and Nueva Iguazú), Chile (Santiago), Colombia (Bogotá, Medellín and Barranquilla), Ecuador (Quito, Guayaquil and Manta), Mexico (Mexico DF), Panama (Panama), Peru (Lima, Arequipa and Piura), Uruguay (Montevideo and Salto), and Venezuela (Caracas,

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<sup>3</sup> See <https://www.caf.com/es/temas/i/investigacion-para-el-desarrollo/encuesta-caf-investigacion/encuesta-caf/>.

Maracaibo and San Cristobal).<sup>4</sup> The interviewees are representative samples of the urban population between 20 and 60 years old, although the population in rural areas is not represented by the data.

We restrict the sample to waves with information on commuting time (i.e., from 2011 onwards), and to workers who are employees or self-employed, with non-missing information on the variables of interest. This leaves a sample of 44,423 individuals, of whom 4,893 live in Argentina, 5,461 in Bolivia, 5,719 in Brazil, 532 in Chile, 5,131 in Colombia, 4,049 in Ecuador, 2,213 in Mexico, 2,651 in Panama, 4,536 in Peru, 4,377 in Uruguay, and 4,861 in Venezuela. See Table A1 in the Appendix for details of the composition of the sample.

The main variable in the analysis is commuting, which is defined in minutes, and as one-way commuting (i.e., commuting *to* work), from the following question: “Approximately, how much time do you spend going from your home to your work?”<sup>5</sup> The ECAF data allow us to compute one-way commuting time from a stylized question<sup>6</sup>, and we can determine the main employment status of respondents, including the following (self-reported) categories: 1) self-employed worker without employees, 2) self-employed worker or business owner with at least one employee worker, 3) employee in the private sector, 4) employee in the public sector. We identify self-employed workers from employment categories 1) and 2); that is to say, as self-employed workers with or without employees. Employees include paid workers in the private and public sector.<sup>7</sup> Thus, our main explanatory variable is a dummy variable that takes value 1 for self-employed workers, and value 0 for employees.

The ECAF data allows us to define several sociodemographic variables that are important when studying commuting behaviors. First, we define the gender of respondents as a dummy variable that takes value 1 for males, and 0 for females. Given that existing research has documented a significant gender gap in commuting time, according to which male workers spend more time commuting than

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<sup>4</sup> The ECAF data also includes some Latino individuals from the US (Los Angeles) for the year 2012. Those individuals are omitted from the sample.

<sup>5</sup> The question is asked in Spanish as follows: “*Aproximadamente, ¿cuánto tiempo demora usted en promedio en llegar desde su vivienda hasta donde trabaja?*”

<sup>6</sup> Other surveys, such as time use surveys, define commuting from time use diaries, which has some advantages, such as producing smaller measurement error (Bonke, 2005; Yee-Kan, 2008; Gimenez-Nadal et al., 2021). The 2018 wave of the ECAF defines commuting time in the following brackets: 1) less than 15 minutes, 2) 15-30 minutes, 3) 31-60 minutes, 4) 60+ minutes. Commuting time is then recoded in this wave taking the mid points of the brackets, and value 60 for 60+ minutes.

<sup>7</sup> Some waves of the ECAF data also include a category 5) worker in a cooperative. These workers are considered as employees.



their female counterparts, it is crucial to control for gender when studying commuting behaviors.<sup>8</sup> Second, we define the age of respondents, measured in years, as well as age squared, to partially control for non-linear effects, as prior research has found that worker age is related to commuting time (van Ommeren and van der Straaten, 2008; McQuaid and Chen, 2012; Gimenez-Nadal et al., 2018; Albert et al., 2019).

We also control for the level of formal education of respondents. Specifically, we define three dummy variables, in terms of the maximum level of education achieved: basic education, for those workers who have not completed or attended secondary education; secondary education, for workers who have completed secondary education, but have not completed or attended University education; and University education, for respondents who have completed University education. Given that human capital is related to commuting times, as highly educated individuals may look for more specialized jobs and thus are likely to commute longer distances/times, it is important to control for workers' education (Rouwendal and Nijkamp, 2004; Dargay and van Ommeren, 2005; Sandow and Westin, 2010; Dargay and Clark, 2012). We control for household composition, and we define the marital status of respondents (a dummy variable that takes value 1 for individuals cohabiting in a married or unmarried couple, 0 otherwise), the presence of children (a dummy that takes value 1 if respondents have children under 17, and value 0 otherwise), and the number of individuals in the household. Summary statistics of these variables are shown in Table A2 in the Appendix.<sup>9</sup>

### 3.1. Descriptive statistics

Table 1 shows summary statistics of commuting time, by self-employment status. The sample consists of 24,346 employee workers, and 20,077 self-employed workers, that is, 54.8% of the workers are employees and 45.2% are self-employed. This rate of self-employment is well above the rates found in prior studies focusing on developed economies, such as the US or European countries, where self-

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<sup>8</sup> The gender gap in commuting time has been thoroughly analyzed in recent years. See Hanson and Johnston (1985), White (1986), van der Berg and Gorter (1997), Doyle and Taylor (2000), Gossen and Purvis (2005), van Ommeren and van der Straaten (2008), Hjorthol (2008), Sandow (2008), Sandow and Westin (2010), Scheiner (2010), Roberts et al. (2011), Dargay and Clark (2012), McQuaid and Chen (2012), O'Kelly et al. (2012), Scheiner and Holz-Rau (2012), Hjorthol and Vågane (2014), Albert et al. (2019), and Gimenez-Nadal et al. (2022).

<sup>9</sup> Unfortunately, the ECAF data does not allow us to define other demographic variables related to commuting times, such as occupation, wages, race, or citizenship status (Ross and Zenou, 2008; McQuaid and Chen, 2012; Mulalic et al., 2014; Gimenez-Nadal et al., 2018; Le Barbanchon et al., 2021).

employment rates range around 14% (e.g., Gimenez-Nadal et al., 2020). Regarding commuting time, the average employee worker in the sample spends about 44.3 minutes commuting to work, whereas the average self-employed workers spends about 36.4 minutes commuting to work. This produces an average difference of 7.9 minutes between the time spent commuting by employees and that of self-employed workers, which is statistically significant at standard levels ( $p < 0.001$ ) and represents the excess commuting of employees in the van Ommeren and van der Straaten (2008) setting. In other words, about 17.8% of the time spent commuting by employees can be considered excess commuting.

Table 1 also shows the average commuting time of employees and self-employed workers, for each of the countries represented in the sample. The time spent commuting by employees ranks between 53 minutes in Mexico, to 31 minutes in Uruguay, while the country in which the self-employed spend more time commuting is also Mexico (about 43 minutes), vs Chile and Uruguay where self-employed workers spend less than 30 minutes commuting to work. Furthermore, Table 1 shows that the self-employed spend less time commuting than employees in all the analyzed countries, with differences being in all cases highly significant – based on a t-type test of sample means. These differences are consistent with the theoretical framework proposed by van Ommeren and van der Straaten (2008), which suggests that employees in the studied countries face excess commutes ranking from 16 minutes in Chile to 11 minutes in Brazil and Mexico, to about 3 minutes in Bolivia and Uruguay.

Figure 1 shows the evolution of commuting times of employees and self-employed workers in the analyzed countries.<sup>10</sup> Contrary to existing evidence for developed economies (e.g., Susilo and Maat, 2007; Kirby and LeSage, 2009; McKenzie and Rapino, 2009; Gimenez-Nadal et al., 2022), the evolution of commuting time in Latin American countries does not exhibit clearly increasing patterns during the period analyzed. Commutes have remained relatively stable at around 40 minutes per day in the analyzed periods, though with slight increases and decreases in certain periods of time. Nevertheless, the main takeaway of Figure 1 is that the average time spent commuting by self-employed workers has remained below the average time spent commuting by employees during the period 2011-2018. The only exceptions in which average commutes by the self-employed exceed average commutes of employees are observed in Argentina (2016), Bolivia (2016), Ecuador (2016),

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<sup>10</sup> The density of commuting time for employees and self-employed workers, for the pooled sample, is shown in Figure A1 in the Appendix.

and Panama (2012). The specific reasons for these particular exceptions are left for further research and are beyond the scope of this paper.

## 4. Empirical strategy and results

The empirical results shown in the previous section are based on averages and raw differences between employee and self-employed workers. However, such evidence presents a first descriptive analysis only. We next analyze the relationship between commuting time and self-employment, controlling for other factors that may be conditioning the relationship. First, we focus on the difference in commuting time between self-employed workers and employees, net of observable demographics and time effects. We then explore whether commuting mode choices may condition the gap in commuting time. Finally, we explore if the employee and self-employed workers face better/worse access to public transit services, and whether this factor determines the gap in commuting time between employees and the self-employed.

### 4.1 Commuting and self-employment

We analyze the gap in commuting time between employees and self-employed workers, net of observable worker demographics, following prior analyses by van Ommeren and van der Straaten (2008) and Gimenez-Nadal et al. (2018, 2020). For each individual  $i$  living in country  $c$  during year  $t$ , we estimate Equation (1) by Ordinary Least Squares:

$$C_{ict} = \beta_0 + \beta_1 S_{ict} + \beta_2' X_{ict} + \delta_c + \gamma_t + \varepsilon_{ict}, \quad (1)$$

where  $C_{ict}$  represents commuting time,  $X_{ict}$  is a vector of worker socio-demographic characteristics (gender, age, age squared, education, living in couple, having kids, and family size),  $\delta_c$  represents country fixed effects,  $\gamma_t$  represents year fixed effects, and  $\varepsilon_{ict}$  is the error term. Estimates include sample weights, and robust standard errors to partially control for potential heteroskedasticity.<sup>11</sup>

Results of estimating Equation (1) are shown in Table 2. Column (1) shows the results for the full sample, including both male and female workers, and also including zero-commuters. The results

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<sup>11</sup> Alternative estimates could be based on censored regression models, such as the Tobit model (Tobin, 1958), since commuting times are censored and cannot take negative values. However, Foster and Kalenkoski (2013) show that Tobit and OLS estimates produce similar conclusions. For the sake of simplicity, and following existing research, we rely on OLS estimates.

indicate that, net of observable characteristics, self-employed workers spend about 8.2 fewer minutes commuting to work than their employee counterparts, with this difference being statistically significant at standard levels. Following van Ommeren and van der Straaten (2008), this difference indicates that about 18.5% of the employees' commuting time is excess commuting, reinforcing the conclusion that self-employed workers spend less time commuting than employee counterparts. The self-employed choose their workplaces more optimally than employees choose job vacancies, which generates excess commuting among the latter group of workers (van Ommeren and van der Straaten, 2008).

This result contrasts with prior results in van Ommeren and van der Straaten (2008), Gimenez-Nadal et al. (2018, 2020), and Albert et al. (2019). For instance, van Ommeren and van der Straaten (2008) found, for the Netherlands, that about 40-60% of employee commuting is excess commuting, due to imperfect search market information. Our results are well below this difference, but closer to estimates in the US by Gimenez-Nadal et al. (2018), and in Spain by Albert et al. (2019), who estimate differences of 17% and 13%, respectively, in the commuting time of employees and the self-employed. The quantitative difference is also close to results for European countries (Gimenez-Nadal et al., 2020), which rank between 18.4 and 24.7 minutes when considering two-way commuting times (i.e., the time of commuting *to* and *from* work).

Regarding the remaining explanatory variables, the results show that male workers spend about 1.8 more minutes commuting than their female counterparts, net of observable characteristics, with this coefficient being highly significant. This result is in line with existing research that has documented a statistically significant gender gap in commuting time (Gimenez-Nadal et al., 2022). Furthermore, worker age and commuting time are related, following an “inverted-U” shape, suggesting that middle-aged workers commute the longer, while both younger and older workers tend to spend less time commuting, in line with results from Gimenez-Nadal et al. (2018) for the US. Regarding education, the results suggest that there are no statistically significant differences in the time spent commuting that depend on workers' education level in the analyzed Latin American countries. Finally, variables capturing household composition are also not statistically significant, indicating that household composition is unrelated to worker commuting behaviors in Latin American countries, which is contrary to prior studies of developed economies.

We run some robustness checks. First, given that male and female workers exhibit different commuting behaviors, we estimate Equation (1) separately for male and female workers in our sample. Estimates for males and females separately are shown in Columns (2) and (3) of Table 2, respectively, and we find that male employees spend about 8.3 more minutes commuting than their self-employed counterparts, whereas the commuting time gap between employee and self-employed female workers is about 7.9 minutes. These two coefficients are statistically significant at standard levels, whereas we find no significant differences, according to a  $t$ -type test ( $p = 0.695$ ). Thus, the commuting time gap between self-employed and employee workers seems to be similar for males and females, thus concluding that the excess commuting faced by employees does not depend on worker gender.

Second, we follow van Ommeren and van der Straaten (2008) and re-estimate Equation (1) restricting the sample to commuters. That is to say, we remove teleworkers and work-from-home workers. Results are shown in Column (4) of Table 2, and we find that when zero-commuters are omitted, the gap in commuting time between employees and self-employed remains highly significant, as employees spend about 7.9 more minutes per day commuting to work than similar self-employed workers. Furthermore, the gap in commuting time between employees and self-employed workers seems not to depend on the presence of zero-commuters, since the coefficient of interest in Columns (1) and (4) are not statistically different ( $p = 0.614$ ).

Third, we estimate Equation (1) but including commuting time measured in log-of-minutes. Because the log of zero is not defined, estimates in logs are also restricted to commuters, i.e., zero-commuters are omitted. That way, the coefficient of interest,  $\beta_1$ , would represent the gap in commuting time between employees and self-employed workers, net of observed characteristics, but measured in percentages. Results are shown in Column (5) of Table 2. Estimates indicate that self-employed workers who commute to work spend about 29.5% less time commuting to work than their employee counterparts, net of observable factors, which is equivalent to 13.1 fewer minutes.

In summary, Table 2 shows a significant difference in commuting time between employees and self-employed workers, with the latter spending between 13.1 and 7.9 fewer minutes commuting than the former, net of observable factors. This points to employees facing a significant time allocation burden in terms of excess commuting, according to van Ommeren and van der Straaten's (2008) theoretical model. Furthermore, Table 2 also shows that this gap between employees and self-

employed workers does not depend on the gender of workers, nor on the presence of zero-commuters in the sample.

Table 2 shows results controlling for country fixed effects, although estimates do not allow us to analyze potential differences among countries, and it could be the case that the estimated gap arises from specific countries, whereas in other countries the gap is not significant. To address these potential cross-country differences, we estimate Equation (1) separately for each of the countries in the sample, omitting country fixed effects. The main results are shown in Table 3.<sup>12</sup> Estimates indicate that, for all the countries in the sample, the commuting time gap between employees and self-employed worker is statistically significant at standard levels ( $p < 0.001$  in all the countries). Specifically, self-employed workers in Argentina spend about 5.5 fewer minutes per day commuting to work than similar employee workers. That difference is about 4.5 minutes in Bolivia, 10.8 minutes in Brazil, 16.4 minutes in Chile, 6.9 minutes in Colombia, 7.1 minutes in Ecuador, 10.0 minutes in Mexico, 8.5 minutes in Panama, 7.1 minutes in Peru, 2.6 minutes in Uruguay, and 5.5 minutes in Venezuela.<sup>13</sup> The reasons behind these cross-country differences remain unclear, though existing research has documented that commuting behaviors crucially depend on transport infrastructures, urban forms, transport policies, housing prices, public transit services, or the share of car ownership, among others (Næss, 2003, 2006, 2009; Santos et al., 2013; Mitra and Saphores, 2019; Gimenez-Nadal et al., 2022). A deeper analysis of these differences is left for further research.

## 4.2. The impact of transport mode

We next study the difference in commuting time between employee and self-employed workers, depending on the main transport mode used to commute to work. It could be that these differences are due to a difference in the mode of transport. Note that, whereas prior studies have found that the private vehicle is the preferred way of commuting in developed economies (Gimenez-Nadal et al., 2018, 2021), we find that most workers in the analyzed countries commute to work using public transit. This result is in line with existing research suggesting that private vehicles are mostly used to

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<sup>12</sup> The full set of results are shown in Table A3 of the Appendix.

<sup>13</sup> Table A4 in the Appendix shows similar estimates for commuters only by country, and the results are robust to Table 3.

commute among workers with higher income levels, and thus the use of private vehicles in developing countries is not as common as in developed countries (Lucas, 2012).

According to the ECAF data, 18.75% of the sample (6,075 workers) commute by private vehicle, and 6.49% (2,842 workers) commute actively. This leaves 72.48% of the sample (23,484 workers) using public transit as their main transport mode when commuting to work.<sup>14</sup> Furthermore, of the 6,075 respondents who commute in private vehicles, 43.3% (2,629 respondents) are self-employed, whereas the remaining 56.7% (3,446 respondents) are employees. Among workers who commute actively, 56.6% (1,608 respondents) are self-employed, and 43.4% (1,234 respondents) are employees. Finally, 41.2% (9,687 respondents) of individuals who commute via public transit are self-employed, and the remaining 58.8% (13,797 respondents) are employees.

These summary statistics show that comparatively more self-employed workers commute actively, whereas more employees commute via public transit or private vehicle. Nevertheless, to study whether the amount of excess commuting faced by employees depends on the means of transport used to commute to work, we re-estimate Equation (1), depending on the primary means of transport used. The main results are shown in Table 4 — additional coefficients are shown in Table A5 of the Appendix. Estimates show that the average self-employed worker who commutes by private vehicle spends about 3.5 fewer minutes commuting to work than the similar employee, with the difference being statistically significant at standard levels. Second, the average self-employed who commutes by public transit devotes about 6.2 fewer minutes to commuting to work than their employee counterpart, with this difference being again highly significant. On the other hand, the difference in the time spent commuting to work between self-employed workers and employees is estimated to be not significant at standard levels in the case of active commuting.

Results in Table 4 suggest that most of the excess commuting faced by employees is concentrated among those who commute via public transit. Employees who commute by private vehicle also face a significant amount of excess commuting, relative to their self-employed counterparts, though it is significantly smaller ( $p < 0.001$ ). Finally, the commuting times of employees and self-employed workers who commute actively seem to be similar, and thus these employee workers seem not to be subject to excess commuting. Because most of the difference between employees and self-employed workers is concentrated among public transit commuters, who are the most common commuters in

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<sup>14</sup> Transport mode is not available for the 2015 and 2016 waves of the ECAF data, so those waves are omitted from this analysis.

the sample, we next analyze whether access to public transit services differs between employees and the self-employed.

The ECAF data includes information on access to public transit, first collected as access to a range of services at a distance smaller than three squares from home for the waves from 2011 to 2014 (inclusive), and as access to the same transit services at a time under 10 minutes from 2017 and 2018. This data is missing however for the 2015 and 2016 waves of the ECAF data, and thus these two waves are omitted from this analysis. The transit services available in the data include: 1) bus, 2) subway, 3) taxi, 4) train, 5) mototaxi, 6) metropolitan bus, 7) other transport. From these categories, we define four dummy variables, that take value 1 if workers have easy access (i.e., less than three squares distance or under 10 minutes time) to public transit systems, 0 otherwise, and the four transit systems are: bus (categories 1 and 6), subway (category 2), taxi (categories 3 and 5), and train (category 4).

Overall, 93.5% of self-employed workers have easy access to a bus station, and 59.44% have easy access to taxi or mototaxi station. Conversely, only 23.5% have a close access to subways, and only 2.54% have a train station nearby. On the other hand, regarding employees, 94.4% have a close access to a bus station, 63.4% to a taxi or mototaxi station, 20.7% to a subway station, and 3.71% to a train station. Thus, summary statistics do not suggest that employees and self-employed workers differ in their access to public transit services, with most workers having easy access to a bus station, which is the most accessible public transit system, followed by taxi stations, subway stations, and finally train stations, to which very few employees and self-employed workers have access to.

To study differences in access to these services, net of worker observable characteristics, we estimate Equation (3) using OLS, as follows:

$$Access_{ict} = \beta_0 + \beta_1 S_{ict} + \beta_2' X_{ict} + \delta_c + \gamma_t + \varepsilon_{ict}, \quad (2)$$

where  $Access_{ict}$  represents the dummy variables that measure the easy access to transit services, and all the remaining elements of Equation (3) are analogous to those in Equations (1) and (2). The main results are shown in Table 5. Column (1) shows estimates for access to bus stations, Column (2) for access to subway stations, Column (3) for access to taxi or mototaxi stations, and Column (4) for train stations. Additional coefficients are shown in Table A6 in the Appendix.



Estimates show that self-employed workers have slightly better access to bus stations, as the self-employed are about 0.6% more likely to live closer to a bus station than an employee counterpart, net of observable characteristics. This coefficient is statistically significant at the 90% level only, and the *economic* significance of this difference seems almost negligible. Regarding access to subway stations and to taxi/mototaxi stations, results suggest that there are no differences between employee workers and self-employed workers, as the coefficients are very small and not statistically significant. On the other hand, results suggest that self-employed workers are 1.2% less likely to reside close to a train station than employees, with the associated coefficient being statistically significant at the 95% level. This suggests that employees have better access to train services than the self-employed, though the percentage of both type of workers with access to this service is very small anyway. In summary, results in Table 5 suggest that access to transit services is not driving differences in commuting time between employees and self-employed workers.

## 5. Conclusions

This paper analyzes the commuting behavior of workers in urban areas of eleven Latin American countries, with a focus on the differences between employee and self-employed workers. We use data from the ECAF survey, for Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Panama, Peru, Uruguay, and Venezuela. The results show that, on average, employees spend about 8.2 more minutes commuting to work than their self-employed counterparts, net of observable characteristics. Despite some quantitative differences, results are qualitatively robust across the eleven countries, indicating that about 18.5% of the employees' commuting time is excess commuting, according to the model of van Ommeren and van der Straaten (2008). This result is in line with results for the Netherlands (van Ommeren and van der Straaten, 2008), the US (Gimenez-Nadal et al., 2018), and for a pool of European economies (Gimenez-Nadal et al., 2020). To the best of our knowledge, this is the first exploration of commuting and self-employment in Latin America, and the first analysis of commuting in general terms in a multi-country setting in the region. The paper complements prior analyses of commuting behaviors in Latin America, a region that has received less attention than developed countries (Gainza and Livert, 2013; Neto et al., 2015; Huertas-Delgado et al., 2018).

The results also suggest that excess commuting (i.e., differences in the commuting of employees and the self-employed) is concentrated in commutes by public transit, which is the preferred mean of

transport in the analyzed countries. To a lesser extent, commuters in private vehicles also face excess commuting but estimates suggest that individuals who commute actively are not subject to excess commuting. Furthermore, we explore if differences in commuting time arise from the self-employed having easier access to public transit services, but results suggest that this is not the case, since all workers are found to have a similar level of access to these services.

The analysis is subject to certain limitations. First, the data is cross-sectional and is potentially subject to unobserved heterogeneity and reverse causality. Despite that the analysis is based on a theoretical model and does not aim at finding causal results, it is important to note that the empirical results are based on conditional correlations only. Second, estimates reveal low accuracy, as commuting times seem to be determined by a strong stochastic and/or non-observable component (Connolly, 2008; van Ommeren and van der Straaten, 2008; Krüger and Neugart, 2018). Finally, the ECAF data does not include information on workers' occupation, which is related to commuting behaviors, and is focused on urban regions only. The use of different data sources, such as detailed time use surveys (Gimenez-Nadal and Molina, 2022), panel databases, or specific regional surveys, with detailed information at the rural level, may be enlightening.

Despite these limitations, some practical conclusions can be derived from the analysis. Results should encourage further research on the relationship between commuting behaviors and communication infrastructures, which appear to be interconnected in a complex way. In this sense, improvements in public transit services may reduce worker commuting costs and help workers to re-orient their residence and/or workplace choices. Besides that, shorter commutes would be beneficial for the whole society through their impact on traffic congestion, agglomeration, and air pollution, which is a matter of current concern for policy makers, especially in urban areas of Latin American countries.

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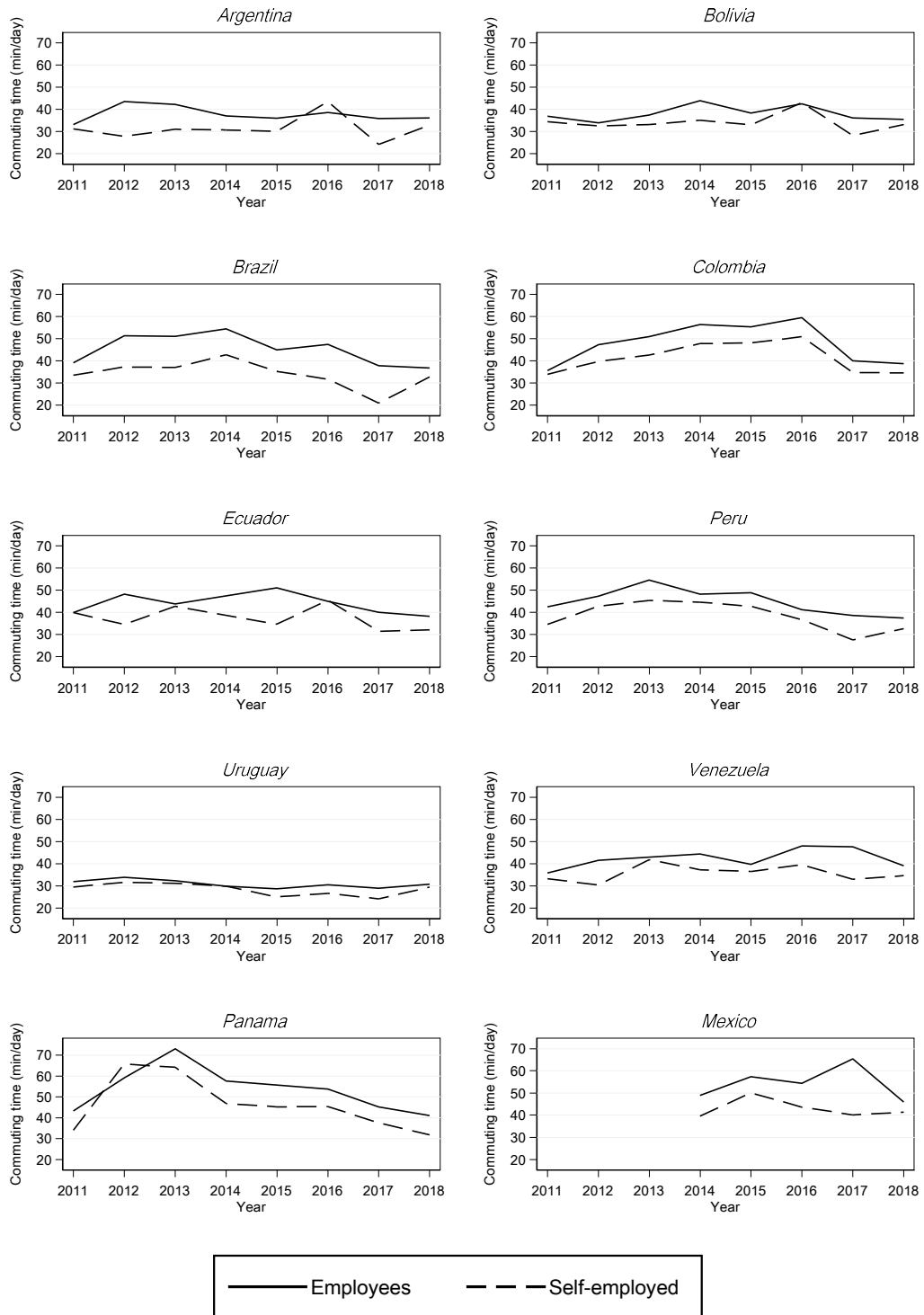
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Figure 1: Trends in commuting time



Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Commuting time is measured in minutes per day, as one-way commuting (i.e., commuting to work). Estimates computed using sample weights.

**Table 1. Average commuting time, pooled sample and by country**

Commuting time	Employees		Self-employed		Difference	
	Mean	N. Obs.	Mean	N. Obs.	Diff.	<i>p</i> -value
Pooled sample	44.282	24,346	36.416	20,077	7.866	(<0.001)
Argentina	37.895	2,846	32.398	2,047	5.497	(<0.001)
Bolivia	37.022	2,278	33.895	3,183	3.127	(<0.001)
Brazil	46.062	3,057	35.077	2,662	10.985	(<0.001)
Chile	42.55	332	26.249	200	16.301	(<0.001)
Colombia	47.327	2,676	41.311	2,455	6.016	(<0.001)
Ecuador	44.241	1,973	37.416	2,076	6.825	(<0.001)
Mexico	53.282	1,225	42.73	988	10.552	(<0.001)
Panama	50.297	1,752	41.349	899	8.948	(<0.001)
Peru	44.812	2,158	37.655	2,378	7.157	(0.002)
Uruguay	30.886	3,034	28.333	1,343	2.553	(<0.001)
Venezuela	41.712	3,015	35.699	1,846	6.013	

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Commuting time is measured in minutes per day, and represents one-way commuting (i.e., commuting *to* work). Summary statistics computed using sample weights. Differences computed as the average value for employees, minus the average value for the self-employed; *p*-values computed using *t*-type tests.

**Table 2. Estimates on commuting time**

VARIABLES	(1) Baseline	(2) Men	(3) Women	(4) Commuters	(5) Log commuting
Self-employed	-8.217*** (0.509)	-8.304*** (0.665)	-7.896*** (0.803)	-7.854*** (0.509)	-0.295*** (0.015)
Being male	1.776*** (0.504)	-	-	1.791*** (0.504)	0.068*** (0.014)
Age	0.370** (0.166)	0.687*** (0.210)	-0.064 (0.271)	0.342** (0.166)	0.009* (0.005)
Age sq. /10	-0.050** (0.020)	-0.087*** (0.025)	-0.001 (0.033)	-0.046** (0.020)	-0.001** (0.001)
Edu.: secondary	-1.089 (0.793)	-0.767 (1.027)	-1.872 (1.245)	-1.119 (0.793)	0.011 (0.022)
Edu.: University	-1.427 (0.881)	-1.103 (1.159)	-2.327* (1.366)	-1.496* (0.881)	0.033 (0.024)
Being married	0.364 (0.595)	0.535 (0.779)	0.086 (0.922)	0.446 (0.596)	0.006 (0.017)
Having kids	0.138 (0.749)	1.276 (0.968)	-2.204* (1.200)	0.207 (0.752)	-0.015 (0.021)
Family size	0.252* (0.149)	0.400** (0.195)	0.075 (0.229)	0.272* (0.150)	0.005 (0.004)
Constant	26.617*** (3.511)	22.581*** (4.484)	36.390*** (5.592)	27.174*** (3.505)	3.040*** (0.104)
Country F.E.	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes
Observations	44,423	26,060	18,363	44,214	44,214
R-squared	0.044	0.044	0.049	0.043	0.060

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Robust standard errors in parentheses. The dependent variable is commuting time, measured in minutes per day in Columns (1-4), and in log-minutes per day in Column (5). Estimates computed using sample weights. \*\*\* Significant at the 99% level; \*\* significant at the 95% level; \* significant at the 90% level.

**Table 3. Estimates, by country**

VARIABLES	(1) Argentina	(2) Bolivia	(3) Brazil	(4) Chile	(5) Colombia	(6) Ecuador	(7) Mexico	(8) Panama	(9) Peru	(10) Uruguay	(11) Venezuela
Self-employed	-5.506*** (1.101)	-4.546*** (0.813)	-10.836*** (1.215)	-16.437*** (2.626)	-6.903*** (1.113)	-7.123*** (1.096)	-10.006*** (1.484)	-8.488*** (1.909)	-7.056*** (1.201)	-2.570*** (0.915)	-5.460*** (0.921)
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,893	5,461	5,719	532	5,131	4,049	2,213	2,651	4,536	4,377	4,861
R-squared	0.025	0.025	0.050	0.108	0.065	0.034	0.053	0.079	0.059	0.022	0.040

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Robust standard errors in parentheses. The dependent variable is commuting time, measured in minutes per day. Estimates computed using sample weights. \*\*\* Significant at the 99% level; \*\* significant at the 95% level; \* significant at the 90% level.

#### 4. Estimates by transport mode

VARIABLES	(1) Private vehicle	(2) Public transport	(3) Active commuting
Self-employed	-3.479*** (1.138)	-6.150*** (0.701)	-1.327 (1.046)
Demographics	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
Observations	6,057	23,387	2,898
R-squared	0.053	0.055	0.057

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Robust standard errors in parentheses. The dependent variable is commuting time, measured in minutes per day. Estimates computed using sample weights. \*\*\* Significant at the 99% level; \*\* significant at the 95% level; \* significant at the 90% level.

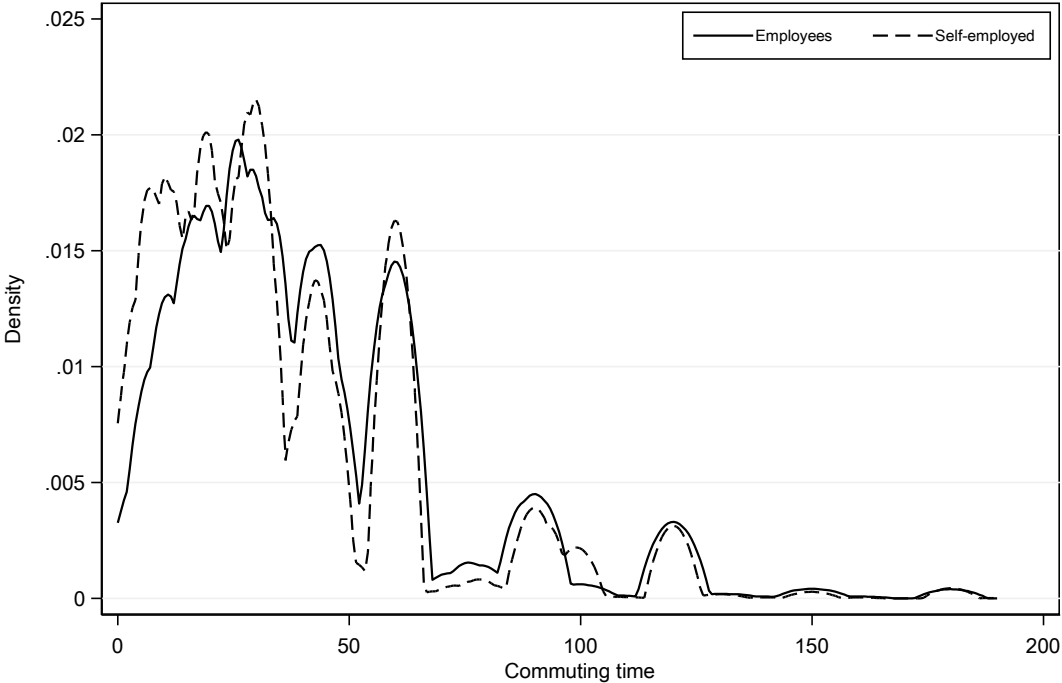
**Table 5. Self-employment and access to public transport services**

VARIABLES	(1) Access to bus	(2) Access to subway	(3) Access to taxi	(4) Access to train
Self-employed	0.006* (0.004)	-0.002 (0.007)	0.004 (0.009)	-0.012** (0.005)
Demographics	Yes	Yes	Yes	Yes
Country F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Observations	32,551	32,551	32,551	32,551
R-squared	0.029	0.274	0.108	0.069

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Robust standard errors in parentheses. The dependent variable is commuting time, measured in minutes per day. Estimates computed using sample weights. \*\*\* Significant at the 99% level; \*\* significant at the 95% level; \* significant at the 90% level.

Appendix: Additional results

Figure A1: Density of commuting time



Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Commuting time is measured in minutes per day, as one-way commuting (i.e., commuting *to* work).



**Table A1. Sample composition**

N. observations	2011	2012	2013	2014	2015	2016	2017	2018
Country								
Argentina	829	521	468	642	549	940	519	425
Bolivia	925	690	815	642	568	652	625	544
Brazil	1024	654	908	572	484	1241	437	399
Chile	-	-	-	-	-	-	532	-
Colombia	862	501	847	527	436	901	507	550
Ecuador	613	661	771	-	471	516	525	492
Mexico	-	-	-	491	356	477	370	519
Panama	462	253	309	330	290	357	308	342
Peru	897	667	373	606	410	555	498	530
Uruguay	709	536	339	574	610	603	535	471
Venezuela	925	597	514	606	528	928	398	365

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers.

**Table A2. Summary statistics**

Variables	Employees		Self-employed		Difference	
	Mean	S.Dev.	Mean	S.Dev.	Diff.	<i>p</i> -value
Commuting time	44.282	33.369	36.416	31.447	7.866	(<0.001)
Being male	38.367	10.383	41.233	10.59	-2.866	(0.533)
Age	0.159	0.365	0.236	0.425	-0.077	(<0.001)
Education: basic	0.569	0.495	0.559	0.497	0.01	(<0.001)
Education: secondary	0.272	0.445	0.205	0.404	0.067	(0.113)
Education: University	0.395	0.489	0.362	0.481	0.033	(<0.001)
Being married	0.795	0.404	0.831	0.375	-0.036	(<0.001)
Having kids	3.81	1.681	3.878	1.776	-0.068	(<0.001)
Household size	44.282	33.369	36.416	31.447	7.866	(<0.001)
N. Observations	24,346		20,077			

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Commuting time is measured in minutes per day, and represents one-way commuting (i.e., commuting *to* work). Age is measured in years. Summary statistics computed using sample weights. Differences computed as the average value for employees, minus the average value for the self-employed; *p*-values computed using *t*-type tests.

**Table A3. Additional results, by country**

VARIABLES	(1) Argentina	(2) Bolivia	(3) Brazil	(4) Chile	(5) Colombia	(6) Ecuador	(7) Mexico	(8) Panama	(9) Peru	(10) Uruguay	(11) Venezuela
Self-employed	-5.506*** (1.101)	-4.546*** (0.813)	-10.836*** (1.215)	-16.437*** (2.626)	-6.903*** (1.113)	-7.123*** (1.096)	-10.006*** (1.484)	-8.488*** (1.909)	-7.056*** (1.201)	-2.570*** (0.915)	-5.460*** (0.921)
Being male	2.234** (1.066)	0.630 (0.796)	1.418 (1.194)	6.070** (2.771)	-1.086 (1.084)	2.243** (1.103)	2.504 (1.545)	1.600 (1.851)	6.358*** (1.157)	-3.813*** (0.867)	-0.753 (0.886)
Age	-0.339 (0.396)	0.447 (0.274)	0.960** (0.379)	-0.920 (1.012)	0.170 (0.398)	0.071 (0.381)	1.055* (0.609)	-0.445 (0.654)	-0.559 (0.382)	0.126 (0.288)	0.023 (0.297)
Age sq. /10	0.033 (0.047)	-0.045 (0.033)	-0.135*** (0.044)	0.111 (0.128)	-0.004 (0.048)	-0.019 (0.047)	-0.134* (0.075)	0.036 (0.079)	0.086* (0.046)	-0.013 (0.034)	-0.016 (0.036)
Edu.: secondary	-1.988 (1.496)	-3.590*** (1.055)	-0.726 (1.494)	-4.921 (6.668)	-0.982 (1.750)	-6.666*** (1.737)	2.870 (3.313)	-11.680*** (4.342)	1.318 (2.666)	-2.949*** (1.139)	2.664** (1.298)
Edu.: University	0.882 (2.053)	-5.418*** (1.212)	-1.253 (1.800)	-10.984 (6.687)	-1.371 (1.907)	-7.780*** (1.828)	7.198** (3.490)	-9.823** (4.507)	-1.938 (2.788)	-4.315*** (1.309)	6.693*** (1.441)
Being married	-1.132 (1.186)	0.313 (0.856)	0.290 (1.502)	0.335 (3.141)	1.208 (1.089)	0.187 (1.209)	0.529 (2.099)	-2.620 (1.969)	2.192 (1.383)	-0.075 (0.916)	0.962 (0.982)
Having kids	0.563 (1.585)	1.045 (1.109)	-0.824 (1.619)	5.413* (3.004)	0.058 (1.339)	1.244 (1.524)	1.308 (2.521)	6.957** (2.777)	0.113 (1.809)	0.628 (1.258)	-0.225 (1.217)
Household size	0.504* (0.300)	0.344* (0.187)	0.062 (0.393)	-0.121 (0.803)	1.194*** (0.337)	-0.098 (0.310)	0.688 (0.534)	0.941* (0.530)	-0.145 (0.327)	0.561** (0.283)	-0.195 (0.298)
Constant	40.338*** (8.195)	27.884*** (5.596)	26.226*** (7.973)	58.541*** (21.252)	27.471*** (8.101)	46.290*** (7.648)	29.237** (12.675)	56.543*** (14.455)	44.793*** (8.176)	31.299*** (6.140)	36.524*** (6.244)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,893	5,461	5,719	532	5,131	4,049	2,213	2,651	4,536	4,377	4,861
R-squared	0.025	0.025	0.050	0.108	0.065	0.034	0.053	0.079	0.059	0.022	0.040

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Robust standard errors in parentheses. The dependent variable is commuting time, measured in minutes per day. Estimates computed using sample weights. \*\*\* Significant at the 99%; \*\* significant at the 95%; \* significant at the 90%.

**Table A4. Estimates on commuters, by country**

VARIABLES	(1) Argentina	(2) Bolivia	(3) Brazil	(4) Chile	(5) Colombia	(6) Ecuador	(7) Mexico	(8) Panama	(9) Peru	(10) Uruguay	(11) Venezuela
Self-employed	-4.953*** (1.107)	-4.398*** (0.813)	-10.414*** (1.215)	-16.141*** (2.633)	-6.500*** (1.111)	-7.050*** (1.097)	-9.857*** (1.484)	-8.351*** (1.910)	-6.964*** (1.202)	-2.249** (0.919)	-5.197*** (0.915)
Being male	2.349** (1.071)	0.723 (0.797)	1.388 (1.196)	5.711** (2.791)	-1.120 (1.083)	2.307** (1.104)	2.511 (1.546)	1.432 (1.852)	6.384*** (1.158)	-3.785*** (0.868)	-0.886 (0.884)
Age	-0.344 (0.398)	0.409 (0.275)	0.898** (0.378)	-0.888 (1.015)	0.127 (0.399)	0.071 (0.381)	1.021* (0.610)	-0.410 (0.654)	-0.569 (0.382)	0.110 (0.289)	-0.008 (0.297)
Age sq. /10	0.036 (0.048)	-0.039 (0.033)	-0.128*** (0.044)	0.108 (0.129)	0.001 (0.049)	-0.018 (0.047)	-0.130* (0.075)	0.032 (0.079)	0.087* (0.046)	-0.010 (0.034)	-0.012 (0.036)
Edu.: secondary	-1.794 (1.505)	-3.517*** (1.057)	-0.880 (1.494)	-4.648 (6.698)	-0.913 (1.753)	-6.671*** (1.739)	2.978 (3.312)	-11.572*** (4.346)	1.377 (2.667)	-2.862** (1.142)	2.598** (1.294)
Edu.: University	0.964 (2.062)	-5.416*** (1.213)	-1.560 (1.800)	-10.896 (6.709)	-1.106 (1.908)	-7.818*** (1.829)	7.239** (3.488)	-9.832** (4.511)	-1.896 (2.789)	-4.394*** (1.312)	6.528*** (1.438)
Being married	-0.979 (1.194)	0.259 (0.857)	0.368 (1.507)	0.301 (3.162)	1.278 (1.085)	0.184 (1.212)	0.582 (2.101)	-2.362 (1.969)	2.201 (1.384)	-0.012 (0.918)	0.935 (0.980)
Having kids	0.641 (1.599)	1.089 (1.111)	-0.728 (1.623)	5.681* (3.011)	0.340 (1.332)	1.255 (1.527)	1.236 (2.518)	7.040** (2.775)	0.148 (1.812)	0.759 (1.261)	-0.224 (1.218)
Household size	0.564* (0.302)	0.321* (0.188)	0.102 (0.396)	-0.223 (0.806)	1.143*** (0.337)	-0.101 (0.310)	0.695 (0.534)	0.943* (0.530)	-0.157 (0.327)	0.576** (0.284)	-0.157 (0.297)
Constant	39.245*** (8.234)	28.558*** (5.606)	27.498*** (7.950)	58.064*** (21.336)	28.451*** (8.125)	46.260*** (7.653)	21.917* (12.638)	55.592*** (14.458)	44.907*** (8.191)	31.487*** (6.149)	37.249*** (6.248)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,848	5,431	5,686	529	5,099	4,039	2,209	2,649	4,527	4,349	4,848
R-squared	0.022	0.025	0.048	0.105	0.064	0.033	0.053	0.078	0.058	0.021	0.037

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers who report non-zero commuting time. Robust standard errors in parentheses. The dependent variable is commuting time, measured in minutes per day. Estimates computed using sample weights. \*\*\* Significant at the 99%; \*\* significant at the 95%; \* significant at the 90%.

**Table A5. Estimates by transport mode, additional results**

VARIABLES	(1) Private vehicle	(2) Public transport	(3) Active commuting
Self-employed	-3.479*** (1.138)	-6.150*** (0.701)	-1.327 (1.046)
Being male	2.854** (1.292)	2.753*** (0.666)	2.892* (1.548)
Age	0.236 (0.404)	0.280 (0.233)	0.380 (0.293)
Age sq. /10	-0.032 (0.047)	-0.043 (0.028)	-0.038 (0.034)
Edu.: secondary	1.304 (1.818)	-2.310** (1.070)	-1.842 (1.562)
Edu.: University	5.268*** (2.030)	-2.399** (1.190)	-3.918** (1.737)
Being married	1.556 (1.235)	0.646 (0.750)	-1.465 (1.608)
Having kids	-0.793 (1.457)	1.151 (0.904)	1.964 (1.789)
Household size	0.326 (0.352)	0.270 (0.186)	-0.495 (0.518)
Constant	18.761** (8.701)	34.314*** (4.832)	8.421 (5.406)
Country F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
Observations	6,057	23,387	2,898
R-squared	0.053	0.055	0.057

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Robust standard errors in parentheses. The dependent variable is commuting time, measured in minutes per day. Estimates computed using sample weights. \*\*\* Significant at the 99%; \*\* significant at the 95%; \* significant at the 90%.

**Table A6. Self-employment and access to public transport services,  
additional results**

VARIABLES	(1) Bus	(2) Subway	(3) Taxi	(4) Train
Self-employed	0.006* (0.004)	-0.002 (0.007)	0.004 (0.009)	-0.012** (0.005)
Being male	0.003 (0.004)	-0.009 (0.007)	-0.004 (0.008)	0.009* (0.005)
Age	-0.004*** (0.001)	-0.001 (0.002)	-0.004 (0.003)	0.001 (0.002)
Age sq. /10	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Edu.: secondary	0.008* (0.005)	0.018* (0.009)	0.093*** (0.013)	0.001 (0.008)
Edu.: University	0.023*** (0.006)	0.031*** (0.011)	0.107*** (0.014)	0.003 (0.009)
Being married	-0.008* (0.004)	-0.015** (0.008)	-0.017* (0.009)	-0.004 (0.005)
Having kids	0.013*** (0.005)	-0.020** (0.009)	0.004 (0.011)	-0.008 (0.007)
Household size	-0.001 (0.001)	-0.001 (0.002)	-0.000 (0.003)	-0.002 (0.001)
Constant	1.087*** (0.026)	0.135*** (0.050)	0.819*** (0.062)	0.131*** (0.037)
Country F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Observations	32,551	32,551	32,551	32,551
R-squared	0.029	0.274	0.108	0.069

Note: The sample (CAF 2011-2018) is restricted to employees and self-employed workers. Robust standard errors in parentheses. The dependent variable is commuting time, measured in minutes per day. Estimates computed using sample weights. \*\*\* Significant at the 99%; \*\* significant at the 95%; \* significant at the 90%.