Too Far to Go to Work? Examining the Effect of Changes in Commute Time on Regional Unemployment

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Abstract

Commute duration significantly influences decision-making in the labour market, especially for job seekers. This article aims to evaluate the effect of improvements in infrastructure on regional unemployment. Utilizing a unique database comprising commuting time data from all Czech municipalities (n = 6241) to their respective regional centres, we identified 1534 changes. Our findings indicate that a one-minute reduction in commuting time to the regional centre is associated with a 0.07 percentage point decrease in the unemployment rate one year later and a 0.19 percentage point decrease after five years. These results suggest that investing in local infrastructure has the potential to mitigate disparities in regional unemployment rates.

Keywords: *commuting, unemployment, road infrastructure, OSRM, New Economic Geography, inter-regional disparities, regional development*

JEL Classification: H54, R41, J61

DOI: https://doi.org/10.31577/ekoncas.2025.01-02.03

Article History: *Received*: September 2024 *Accepted*: February 2025

Introduction

Transport infrastructure investments and improvements are often discussed as a way to promote economic growth or development (Aschauer, 1989; Barro, 1990; Crescenzi, Di Cataldo and Rodríguez-Pose, 2016; European Commission, 2011;

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Hirschman, 1975; Lewis, 1998) that might have an impact on the local labour market (Evers et al., 1987; Evers and Oosterhaven, 2005). Infrastructure improvements may reduce transport costs by enhancing accessibility and flexibility in scheduling logistics (Vickerman, Spiekermann and Wegener, 1999), thereby promoting trade growth and facilitating producers' access to more distant markets (Pol, 2003). Investments in motorway infrastructure empower firms to optimize their inventory more effectively (Shirley and Winston, 2004) and contribute to creating an attractive environment for foreign direct investments (Hong, 2007). Lower overall production costs enable local businesses to achieve higher profitability (Crescenzi, Di Cataldo and Rodríguez-Pose, 2016) and thus expanding their output (Banerjee, Duflo and Qian, 2020).

According to the meta-analysis conducted by Holmgren and Merkel (2017a), significant proportion of the literature on regional labour markets identifies deficiencies in local infrastructure as one of the causes of unemployment. Infrastructure improvements can reduce the commuting time of employees and/or improve the potential for finding matches in the labour market. For these reasons, political actors consider transport infrastructure as a crucial factor in economic development, justifying the necessity of public investments.

The relationship between the quality of transport infrastructure and economic development is not linear nor uniform across regions. The economic impacts of new transport projects depend on several variables, one of which is the degree of development of the existing infrastructure. In developed countries with highly developed transport infrastructure networks, additional investments may not lead to desired economic returns (Banister and Berechman, 2001).There is a critical threshold in the provision of infrastructure beyond which the impact of additional public investment on economic performance is unclear (Rodríguez-Pose, Crescenzi and Di Cataldo, 2018).

The impact of new infrastructure on regional economic dynamics depends also on the type of infrastructure project. 'Global infrastructure', influencing long-distance interactions, primarily alters economic attraction, while 'local infrastructure' mainly affects accessibility (Ottaviano, 2008). The construction of a new infrastructure project does not necessarily lead to an increase in economic activity in all adjacent regions but primarily in new logistics hubs (Redding and Turner, 2015). The decrease in unemployment in regions located near a new infrastructure may not result from higher economic activity but may stem from the migration of workers from peripheral areas (Vickerman, Spiekermann and Wegener, 1999). The theoretical framework for these effects is the New Economic Geography, explaining the asymmetric impact of infrastructure investments on different regions using agglomeration externalities. Due to the network character of the spatial economy, improved infrastructure may help the economic core at the expense of the periphery (Fujita and Thisse, 2002; Ottaviano, 2008; Puga and Venables, 1997; Puga, 2001).

In line with this argument, Vickerman et al. (1999) investigated the impact of the development of the Trans-European Transport network (TEN-T) on core and peripheral regions of the EU and concluded that it was not possible to confirm that TEN-T was a tool that would promote regional cohesion. Similarly, the reduction of regional disparities is not confirmed by Pereira and Andraz (2005) who examined the consequences of infrastructure investments in Portugal, nor by Ciani, de Blasio and Poy (2022) who analysed economic impact of motorway renovation in southern Italy. Outside the EU, Yu et al. (2019) found that high-speed rail connections in China generate an uneven distribution effect between the peripheral and core mega cities. On the other hand, Persyn et al. (2023) suggest that road infrastructure investments have a positive impact in Central and Eastern Europe, in the context of the European Cohesion Policy, as these investments reduce interregional disparities.

The varied impact of infrastructure changes on the elasticity of production is well-documented. Holmgren and Merkel (2017), in their meta-analysis of 776 papers, found that 23% of studies indicated negative elasticities (e.g., Canning, 1999; Evans and Karras, 1994; Kamps, 2006; Pinnoi, 1994). Their results highlighted a wide range of effects, from strongly negative to highly positive. Melo et al. (2013) conducted a meta-analysis including 563 estimates of the effect of transport infrastructure investments on productivity.

Similarly, they found that the effects of transport infrastructure investments on productivity can be positive or negative, with intensity varying across countries, industry groups, and modes of transport. These discrepancies in findings are likely due to differences attributed to the nature of the data, the methods employed, and data treatment approaches.

The effectiveness of investments in infrastructure are significantly affected by political (Rodríguez-Pose, 2000) and institutional factors (Acemoglu and Dell, 2010; Esfahani and Ramírez, 2003; Rodríguez-Pose, 2000). The desire of politicians to be re-elected motivates them to support large scale infrastructure projects instead of investments in local roads and maintenance of the existing infrastructure (Tanzi and Davoodi, 1997).

Although institutions tend to be national, they can vary within countries, especially in federated states (Acemoglu and Dell, 2010). Local institutional conditions must be of an adequate quality and the effectiveness of the local political administration is crucial in the selection of appropriate infrastructure investments which will provide the desired economic returns. Economically underdeveloped regions with weak institutional environments can benefit from a convergence effect and allocate their resources to less ambitious infrastructure projects or rather to other areas of development such as education or innovation (Rodríguez-Pose, Crescenzi and Di Cataldo, 2018).

The New Economic Geography suggest that declining transport costs and the improvement of transport accessibility strengthen agglomeration effects and influence the geographical segmentation of labour markets (Martín-Barroso et al., 2022). As a result, a positive impact on labour productivity can be expected, as the expanded labour market allows workers within the agglomeration to seek more productive employment (Rokicki and Stępniak, 2018). Broadly speaking, according to predictions of economic theory, shortening commuting time has a positive effect on unemployment rates.

However, this effect can be neutralised by various factors such as the generosity of unemployment benefits, home ownership, family structure, neighbourhoods with a high concentration of ethnic minorities, or the presence of social conflict (Martín-Barroso et al., 2022). Studies focusing on transitional economies, where the development of transport networks was a political priority, present ambiguous findings regarding their impact on regional labour markets. While some studies, such as the one conducted by Castillo and Sotelsek (2019) in the case of Poland, demonstrate positive effects on employment, others, like those by Mičúch and Tvrz (2015); Fidrmuc et al. (2023), fail to yield conclusive results. Fidrmuc et al. (2023) discover that a positive impact on local unemployment is contingent upon a higher level of human capital and greater industrialization. Based on the inconsistency of the empirical results mentioned above, we aim to test the effect of an improvement in infrastructure on regional unemployment. Our estimates are based on changes in commute times as a proxy for infrastructure improvements. This approach means we focus on the aggregate ability of infrastructure changes to save users' time and impact the labour market, rather than evaluating individual projects. Consequently, we assess all identifiable changes, though only a minority stem from large-scale projects like new motorway sections. Most observations stem from medium and small projects that have received less attention in the existing literature.

The empirical part of the paper is complementary to other studies examining commuting (e.g., Martín-Barroso et al., 2022), but the difference is the focus on actual changes in commute time that reflect improvements in infrastructure. Other empirical studies dealing with the impact of infrastructure investment are often limited to specific type of roads. Usually, empirical studies are concentrated on motorways (Habrman and Žúdel, 2017) and mainly on the motorways that are part of TEN-T (Balaz et al., 2018; Filčák et al., 2021; Gutiérrez and Urbano, 1996; Vickerman et al., 1999). The use of change in commuting time enables us to abstract from different types of roads and to include less commonly monitored changes in local roads. These are often not reported in the publicly available data at a national level.

The results of some empirical studies have shown the different intensities of the impact that infrastructure improvements have had on small and larger municipalities (Habrman and Žúdel, 2017; Martín-Barroso et al., 2022). The paper is based on a dataset that includes more than 6,000 Czech municipalities of different sizes which enables us to more fully examine the issue. The ambiguous results that have come from empirical studies about the short and long-run effects of infrastructure investment (e.g., Balaz et al., 2018; Holmgren and Merkel, 2017; Melo et al., 2013) highlight the need for further research in this area.

The paper is structured as follows: the next section presents the data and methods used in the analysis including descriptive statistics of the variables. In the following part, there is a discussion of the results, and the main implications of the study are outlined. In the concluding section, the key findings are presented. The results indicate that increased worker mobility is associated with a decline in municipal unemployment rates in the medium term. This implies that not only large-scale infrastructure projects, but also local investments play a substantial role in improvements of regional labour market results.

1. Data and Methods

The empirical examination was conducted using data from the Czech Republic, which has a fragmented regional structure. The Czech Republic has the smallest average size of municipality in Europe (OECD, 2018), which means that all the municipality-level data, published by authorities, are highly detailed, which provides us an exceptionally comprehensive view in international comparison.

The Czech Republic is divided into 13 self-governing regions (NUTS 3 level) and the Capital city of Prague, which has a hybrid legal status and is both a city and a region. Every region has a capital, which is always the largest city in that region and is both the administrative and economic centre. The only exception to this principle is the Central Bohemian region, which encircles the Capital city of Prague. Thus, in this case, Prague serves as the regional capital in both administrative terms and for the purpose of our analyses.

Regional capitals play a crucial role in the commuting structure of the Czech economy, concentrating important proportion of economic activities, including workplaces. According to data from the 2021 Census, among those who commute to work in another town, 31% travel to one of the 13 regional capitals, 15% to one of the 63 district capitals (those that are not regional capitals), and the remaining individuals account for all the other 6178 municipalities in the country. Overall, 29.4% of the working population holds a job position in a regional capital (CZSO, 2024).

In the model, we use a unique database with data obtained from Open Street Maps. We developed our calculations on daily extracts for the Czech Republic provided by Brno University of Technology, where we used the first available extract for each month. (VUT, 2024) Using Open Source Routing Machine implemented in Stata by Huber and Rust (2016), we estimated the commuting time and distance from each municipality (n = 6254) to its respective regional capital. With 13 regional capitals, a total of 6241 estimations were made for each period. We utilized monthly data covering the period from March 2014 to December 2022, spanning 106 time periods in total. All times were estimated twice and averaged; routes from and to the regional capital were calculated to incorporate the effect of asymmetries, such as one-way roads. This provided more than 1.3 million estimations of commuting time.

From the panel of estimates, it was necessary to select municipalities that had experienced a change in commuting time. The compiled data panel contains numerous changes that are not relevant to our analysis, primarily stemming from short-term route diversions, updates, or improvements in map files, etc. Consequently, we applied several restriction criteria to identify the changes that were used in the subsequent analyses:

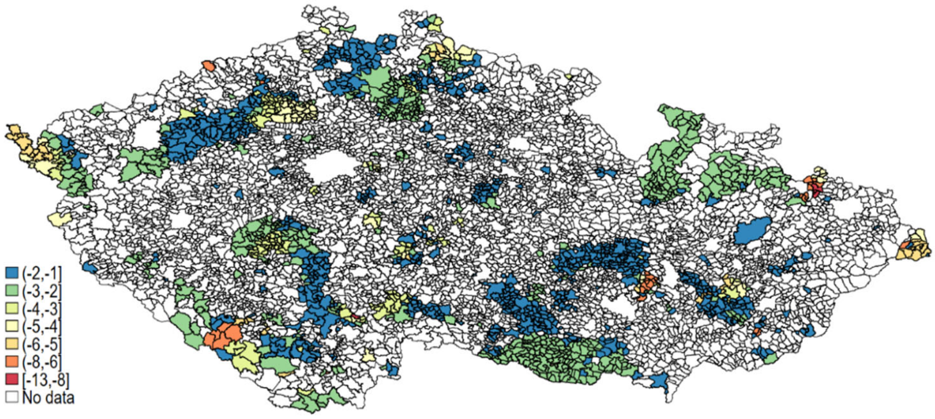
- The change in commuting time had to be negative, we exclusively focused on reductions in commuting time. Although there are situations where the change is positive, this is generally not a result of investments in infrastructure.
- We concentrated solely on permanent changes; a change had to be present for at least a year to avoid the influence of short-term diversions and potential errors in the source data.
- Only changes greater than one minute were considered.
- Along with a change in duration, there also had to be a change in travel distance. This effectively excludes the effects of changes in traffic signs or speed limits that are not a result of an investment.)
- The dataset must contain at least three years of follow-up data after the initial observation of a change in commuting time.

The spatial distribution of the identified changes is illustrated in Figure 1.

The research question examined in the paper is whether investments in infrastructure affect regional unemployment rates. To describe the labour market situation, we utilize data on registered unemployment obtained from the database of the Ministry of Labour and Social Affairs which publishes detailed monthly data at a municipal level (MPSV, 2024).

F i g u r e 1

Observed Changes in Travel Duration to the Regional Capital (in minutes)



Source: Own processing using Open Street map data.

To estimate the effect of a change, a counterfactual needed to be found to allow for a relevant comparison. However, given the uniqueness of each change, we employ a synthetic measure. To construct the counterfactual, the data is divided into 76 smaller administrative units – districts (LAU1 level). For every observed change in commuting time, a synthetic counterfactual is constructed from all the municipalities in the respective district that meet the following conditions:

- The municipality lies in the identical district as the municipality where the change was observed.
- The counterfactual municipality did not experience any change (as described above) in commuting time in the timeframe of our dataset.

Overall, after the application of our restrictions, the dataset contained 1534 changes in commuting time and an equal number of counterfactual observations.

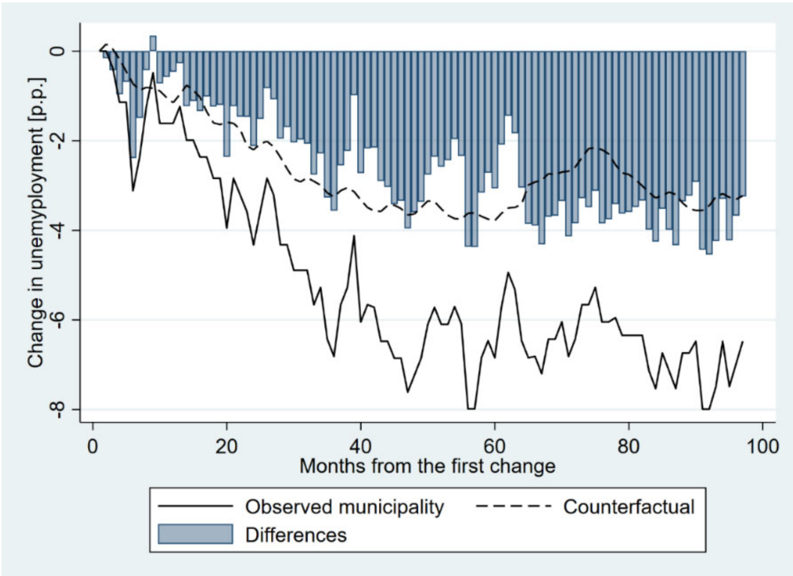
As we aim to measure the effect of the actual treatment on the outcome, namely unemployment in this case, the primary measure used to establish the effect of the change was the difference-in-differences estimation, which is a standard tool for this type of measurement. (Huntington-Klein, 2022) This means that for every n^{th} month, we calculated the difference between the unemployment rate u for the respective month $t+n$ and the unemployment rate at time $t0$, the month when the change in travel duration was first observed. This difference was estimated for both the municipality m and its counterfactual c. The final variable is the difference between both differences.

The whole process can be written as follows:

$$DiDu_{m,c,\, t+n} = \left(u_{m,\, t+n} - u_{m,\, t0}\right) - \left(u_{c,\, t+n} - u_{c,\, t0}\right) \tag{1}$$

This approach results in the findings that are presented in Figure 2. The difference at $t0$ is always 0. In this specific example, for both the observed municipality and the counterfactual, unemployment decreased over time. As can be seen, unemployment in the observed municipality decreased to a lower level than in the counterfactual. Thus, the difference is negative, and these values may be utilized in the subsequent analyses.

F i g u r e 2
A Graphical Example of the DiD Approach for the Used Estimates



Source: Own processing using Open Street map and Ministry of Labour and Social affairs data.

To estimate how the change in commuting time affects regional unemployment, an OLS regression was used that explains the difference-in-differences, as described in equation 1. Therefore, the general formula can be expressed as follows:

$$DiDu_{m,c,\ t+n} = \beta_0 + \beta_1 \Delta comtime_m + \beta_2 u_{m,\ t0} + \mu_i + \upsilon_t + \varepsilon_i \qquad (2)$$

where $DiDu_{m,c,\ t+n}$ is the difference-in-differences estimate of the change in unemployment between the municipality m and its counterfactual c at time $t+n$; β_0 is a constant of the regression, β_1 and β_2 are parameters in the equation, $\Delta comtime_m$ is the change in commuting time as defined above, $u_{m,\ t0}$ is the initial unemployment at the time when the change was detected, μ_i is a fixed effect of the respective region, υ_t is a fixed time effect and ε_i is the error term.

Fixed time effect always covers the initial period of the observed change. The observed changes are distributed throughout the entire six-year period (2014 – 2019, as we require at least a three-year follow-up), but the general macroeconomic environment evolves over time. Therefore, the variability of symmetric shocks affecting the economy, such as fiscal or monetary policy settings, is taken into account by this term. Regional fixed effects, on the other hand, address the influence of prevailing regional asymmetries in the country. Descriptive statistics for the variables used in the regression are displayed in Table 1.

T a b l e 1

Descriptive Statistics

Variable	Obs.	Mean	Std. dev.	Min	Max
Unemployment T+12 months	1534	–0.120	1.989	–11.905	11.952
Unemployment T+24 months	1534	0.083	2.168	–14.739	9.406
Unemployment T+36 months	1534	0.043	2.476	–17.062	10.385
Unemployment T+48 months	1453	–0.099	2.625	–29.843	11.842
Unemployment T+60 months	1332	–0.004	2.755	–23.462	9.028
Change in commuting time	1534	–2.364	1.289	–12.404	–1.005
Initial unemployment	1534	5.382	3.821	0	34.211

Source: Own processing.

While the difference-in-differences estimates can be computed for every month following a change in travel duration, the unemployment rate tends to exhibit considerable seasonality, especially in regions where seasonal works can significantly influence the unemployment rate. To address this seasonality, the differences were explained over one-year intervals. This means that the difference in unemployment between the respective municipality and its counterfactual, is always estimated in the specific month when the change in commuting time was first observed (e.g., if the change was first observed in March 2016, the estimations are conducted for March 2017, March 2018, etc.). The negative value of the variable means that the observed municipality has a lower level of unemployment than the counterfactual, while positive values, on the other hand, indicate higher unemployment. The declining number of observations is caused by the requirement of at least 36 months of follow-up from the observed change, leading to some cases not spanning through 48-month or 60-month periods.

The variable $\Delta comtime_m$ is estimated as the change of the commuting time to the regional capital in minutes. As described above, we only consider negative changes (a decrease in commuting time) greater than one minute. The greatest change we observed was minus 12.4 minutes.

In the regression model, a measure of the initial unemployment rate was applied. The rationale for this is the expected asymmetrical impact of changes; municipalities with higher initial unemployment rates are expected to have more room to reduce it than those with rather low levels of unemployment (e.g. Habrman and Žúdel, 2017). According to Martín-Barroso et al. (2022), there is a greater degree of willingness to commute in areas with higher levels of unemployment which may be one of the reasons for the greater effect on unemployment.

2. Results and Discussion

When analysing the basic difference-in-differences observed in the dataset, the results did not seem to be conclusive. The average result, as presented in Table 1 is very close to zero and falls far from being statistically significant when compared with the standard deviation. Nevertheless, for several reasons, simple averaging does not provide the complete picture. Firstly, the change in duration is not a binary variable, it spans a range from one minute to more than 12 minutes, indicating a significant degree of variation. Even more crucial is the considerable heterogeneity in starting positions, as our dataset contains different regions with distinct structural issues, and some municipalities face specific regional challenges.

To help deal with these issues, the full model was estimated including initial unemployment as a control variable. This allows us to split the effects into two – the effect of the initial situation in the municipality, expected to determine its further development, and the effect of a change in infrastructure. The results are summarized in Table 2.

As seen in the table, the main parameter of our interest, change in commuting time, has a significant relationship with the rate of unemployment (as described in equation (1)). A positive sign indicates that a decrease in commuting time is related to a reduction in unemployment (unemployment in the respective municipality is lower than its counterfactual). The parameter ranges from 0.071 to 0.197 and tends to gradually increase during the first three years after the identification of the change. After the third year, the decline in unemployment tends to stabilize, remaining close to 0.2 percentage points. Using the first equation as an example, the result can be interpreted as follows: in the first year after a change in commuting time was first observed, a one-minute decrease in commuting time was associated with a reduction in unemployment that was 0.071 percent lower in the respective municipality compared to its counterfactual. This aligns with findings from previous studies (Holmgren and Merkel, 2017a; Gibbons et al., 2019; Rokicki and Stępniak, 2018) that highlight how improved infrastructure and reduced commuting time lead to more effective matching in local labour markets. The impact on unemployment is more pronounced in the long run, consistent with the findings of other studies (Balaz, Nezinsky and Dokupilová, 2018; Fujita, Krugman and Venables, 1999; Habrman and Žúdel, 2017).

On the contrary, Mičúch and Tvrz (2015) do not show a clear and lasting effect of new motorway and expressway on the unemployment rate. According to their results, duration of this effect did not exceed the horizon of two years. This ambiguity in the empirical results may be due to the fact that evaluating the economic impacts of new infrastructure on labour markets is hindered by the issue of endogeneity and the challenge of determining the causal relationship between improvements in infrastructure and changes in output (Esfahani and Ramírez, 2003; Leigh and Neill, 2011). Therefore, it is uncertain whether a new road causes the development of a region or whether the road is built in the area where infrastructure investment is required due to the development of the region. New infrastructure projects typically focus on specific areas that are not randomly selected.

The control variable, initial unemployment rate, is significant and negative in all model specifications. Thus, if the initial level of unemployment is high in the municipality, then there is a greater difference after a change in commuting time. The results are in line with Martín-Barroso et al. (2022) who stated that commuting times tend to increase when a worker resides in a municipality with a high level of unemployment. Indeed, the initial unemployment rate is crucial for the possible decrease in unemployment. it is virtually impossible to decrease unemployment when the initial rate is close to zero. Time and regional fixed effects were included in all the model specifications.

T a b l e 2

Impact of the Change in Commuting Time on Unemployment Differential

	T+12 months	**T+24 months**	**T+36 months**	**T+48 months**	**T+60 months**
Change in commuting time	0.071+ (0.095)	0.108* (0.014)	0.197*** (0.000)	0.174*** (0.000)	0.188*** (0.000)
Initial unemployment	–0.097*** (0.000)	–0.213*** (0.000)	–0.319*** (0.000)	–0.426*** (0.000)	–0.441*** (0.000)
Constant	0.437 (0.175)	1.765*** (0.000)	2.799*** (0.000)	3.643*** (0.000)	3.523*** (0.000)
Time fixed effects	Year	Year	Year	Year	Year
Spatial fixed effects	Region	Region	Region	Region	Region
N	1534	1534	1534	1453	1336
R2	0.066	0.159	0.238	0.293	0.315

Note: Difference in differences estimation in months after the identification of a change in commuting time; p-values in parentheses; + p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.005.

Source: Own processing.

As was noted above, our approach does not distinguish between small-scale or large-scale projects as we only examine the effect on commuting time. As this differs from most published studies, we also tested the possible additional impacts of larger-scale projects. There may be reasons why larger projects have a stronger impact on unemployment. Typically, they are more prominently discussed in the media and gain a greater degree of political attention than small changes in local infrastructure; consequently, the public is more aware of the changes (Tanzi and Davoodi, 1997). In addition, some empirical studies could serve as a basis for politicians to justify large-scale infrastructure investments to their voters (Gutiérrez and Urbano, 1996; Leigh and Neill, 2011).

For this reason, we included a dummy variable as a control for situations where the change is induced by a new section of motorway (n = 196); motorways are the backbone of the national road network. As presented in Table 3, the results do not support the idea that large-scale projects have a greater impact. The dummy variable introduced as a control for motorway changes is insignificant in all model specifications, displaying both positive and negative signs. The addition of the dummy variable had almost no effect on the parameters and significance of other variables. This implies that the scale of the project does not appear to be a predictor of a change in unemployment – what matters is the time saved by commuters, not the type of new road. This finding contrasts to the results presented by Balaz et al. (2018a), who argued that a connection to the TEN-T has a greater effect on unemployment than a mere change in commuting time in general.

T a b l e 3

Impact of the Change in Commuting Time on Unemployment Differential with the Inclusion of the Motorway Dummy

	T+12 months	**T+24 months**	**T+36 months**	**T+48 months**	**T+60 months**
Change in commuting time	0.070+ (0.100)	0.110* (0.012)	0.200*** (0.000)	0.170*** (0.001)	0.190*** (0.000)
Initial unemployment	–0.097*** (0.000)	–0.213*** (0.000)	–0.318*** (0.000)	–0.427*** (0.000)	–0.441*** (0.000)
Motorway dummy	–0.037 (0.882)	0.126 (0.626)	0.159 (0.571)	–0.307 (0.310)	0.128 (0.703)
Constant	0.431 (0.184)	1.784*** (0.000)	2.822*** (0.000)	3.600*** (0.000)	3.541*** (0.000)
Time fixed effects	Year	Year	Year	Year	Year
Spatial fixed effects	Region	Region	Region	Region	Region
N	1534	1534	1534	1453	1336
R2	0.066	0.159	0.238	0.294	0.315

Note: Difference in differences estimation in months after the identification of a change in commuting time; p-values in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.005$.

Source: Own processing.

To further analyse the results, we focused on a more detailed grouping of observations. We divided the dataset into five categories based on population size. Czech municipalities are extremely small (OECD, 2018); as displayed in Table 4, the vast majority of the studied municipalities have a population of less than 1000.

As presented in Table 4, within most of the model specifications, the sign of the main variable, change in commuting time, remains positive. The significance differs – unemployment in the group of municipalities with the smallest populations does not appear to be significantly influenced by changes in commuting time. This may be due to the heterogeneity of municipalities with small populations and their sensitivity to small changes. When we consider a municipality with a population of 200, the largest unit in the first subgroup, the workforce averages a hundred people (the average ratio of workers to total population in the Czech Republic is about 50%). In this case, every single worker is approximately one percentage point of the unemployment rate. Thus, a change that is negligible from a macroeconomic point of view, i.e., the bankruptcy of a small firm with several employees, can have a strong impact on the unemployment rate in such a small municipality. This heterogeneity leads to high variations in the data, reducing the statistical significance of the variable. The strongest effect can be observed in the groups with population sizes of 200 to 500 and 500 – 1000. We expect that those groups contain municipalities that are large enough to be reasonably stable, but at the same time are too small to be self-sufficient in terms of the labour market. Our results are consistent with Habrman and Žúdel (2017) who highlighted the situation in urbanized districts where motorway construction has a lesser effect on unemployment. This is related to the higher education and skill level of the citizens in comparison to those in rural areas which enables their inhabitants to find a job more easily.

T a b l e 4

Impact of the Change in Commuting Time on Unemployment Differential; Subsamples of Different Population Sizes

	T+36 months	**T+36 months**	**T+36 months**	**T+36 months**	**T+36 months**
Change in commuting time	0.265+ (0.088)	0.309*** (0.000)	0.129+ (0.089)	0.003 (0.954)	–0.002 (0.984)
Initial unemployment	–0.383*** (0.000)	–0.266*** (0.000)	–0.221*** (0.000)	–0.333*** (0.000)	–0.196+ (0.051)
Constant	3.849*** (0.000)	2.540*** (0.000)	1.720*** (0.003)	2.396*** (0.000)	0.480 (0.698)
Time fixed effects	Year	Year	Year	Year	Year
Spatial fixed effects	Region	Region	Region	Region	Region
Population	Below 200	200 – 500	500 – 1000	1000 – 5000	Above 5000
N	372	518	319	264	56
R^2	0.245	0.239	0.324	0.451	0.595

Note: Difference in differences estimation in months after the identification of a change in commuting time; p-values in parentheses; + p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.005.

Source: Own processing.

Our data reveal a decline in local unemployment, highlighting a significant social effect that influences regional social conditions. Unemployment is closely associated with numerous negative consequences at both individual and societal levels, including poverty, mental health challenges, social isolation, reduced economic productivity, and potential criminality. However, the available data present a limitation: we cannot determine where previously unemployed individuals have found new jobs, as relevant administrative offices do not provide such detailed information. Consequently, the specific effects on the local labour market remain unclear. To fully understand these complex employment dynamics, researchers need access to more granular data on specific economic activities and job placements. The lack of detailed data on job transitions hinders a comprehensive evaluation of the broader impact on the labour market.

Conclusion

Transport infrastructure investments are viewed as a potential tool for promoting social cohesion within the framework of regional policy. By reducing travel times and distances for daily commutes, such investments can play a significant role in regional development, especially in the inner peripheries and other underdeveloped areas.

In the paper, we developed an approach to test the effect of shortening commutes through road infrastructure investment on the outcome in the labour market. Using Open Street Maps data, we estimated commuting times from every municipality in the Czech Republic to the regional centre. Studying the period from March 2014 to September 2022, we identified 1534 municipalities that saw a significant decrease in commuting time to the regional centre. Our analysis revealed that a one-minute decrease in commuting time led to a 0.07 percentage point reduction in the local unemployment rate after twelve months. This effect strengthened over time, with a decrease of approximately 0.2 percentage points observed in the local unemployment rate three years after the reduction in commuting time. The results remained stable within several alternative scenarios, for example when controlled for the scale of infrastructure projects or the size of the municipality. Overall, we found that shortening the commuting distance has the greatest benefit for middle-sized municipalities with the population of 200 to 500.

The results indicate that infrastructure investments positively impact local unemployment, gradually reducing its magnitude over time. In our sample, the mean reduction in commuting time is 2.4 minutes, which corresponds to roughly a half-percentage-point decrease in unemployment – about 8% of the initial unemployment recorded in our dataset. Thus, we conclude that increased worker mobility leads to a medium-term reduction in municipal unemployment rate. The findings indicate that not only major infrastructure projects, broadly examined in the current literature, but also local projects significantly contribute to improvements in labour market outcomes.

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