Impacts and Dynamics of Transport Infrastructure Development on Regional Socioeconomic Growth[1]

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Impacts and Dynamics of Transport Infrastructure Development on Regional Socioeconomic Growth. The article analyses the impact of new highway infrastructure construction on the socioeconomic development of the Hradec Králové region in the Czech Republic. Employing a difference-in-differences approach and a synthetic control method, the study examined the effect of a 50.2 km section of highway connecting Prague and Hradec Králové on indicators such as unemployment, population migration, housing construction, and the establishment of new businesses. To identify long-term impacts, data at the level of "municipalities with extended jurisdiction" were utilized over a nearly two decades with annual frequency. The results suggest that socioeconomic benefits do not occur automatically, and their direction and magnitude can vary depending on the specific regional economic and geographical conditions. At the start of the observed period, the region experienced an increase in unemployment but improved it over time. Following the construction of the highway, the region also experienced lower population growth than initially expected. However, population growth has gradually increased over time, suggesting that the effects of infrastructure investment are lagged. Housing development showed a delayed positive trend, while firm establishment demonstrated limited and statistically insignificant short-term effects. This research provides valuable insights for the planning of future infrastructure projects and their impact on regional development.

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Introduction

As a crucial component of the tertiary sector, transport is essential for the efficient movement of people, goods, and services. Infrastructure investments in transport systems represent a significant aspect of national and regional economic strategies, shaping not only local economies but also the broader economic landscape. The development of transport infrastructure is frequently highlighted as an integral aspect of economic growth, facilitating the smooth opera-

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tion of the economic cycle and fulfilling fundamental societal needs, including production, distribution, and consumption (Eisler et al. 2011; Persyn et al. 2023; Taylor 2021; Zhang – Cheng 2023). Transport networks contribute significantly to the stability of regional economies and provide a foundation for their continuous development and growth. By lowering transportation costs, they also facilitate the movement of labor, goods, and services, making regions more integrated into larger national and international economic systems (Karayalcin – Pintea 2022). Improving transport infrastructure can lead to a substantial reduction in transportation costs (Boardman et al. 2018). Infrastructure investments support the accumulation of human capital and the enhancement of mobility, which subsequently influence the socioeconomic development of region. These improvements provide households and firms with better access to markets (Krugman 1991; Crescenzi et al. 2016; Volpe Martincus et al. 2017; Rokicki et al. 2021; Rodrigue 2024; Shi et al. 2024).

The integration of regional markets and businesses with larger economic hubs is significantly enhanced by improved transport infrastructure, which facilitates greater mobility. This increased connectivity leads to better access to labor markets, expanded business opportunities, and more efficient distribution of goods. Such advancements are vital for boosting regional competitiveness and fostering innovation in previously less accessible areas. Enhanced accessibility improves service quality, reduces production costs, and boosts productivity, thereby stimulating economic activity and encouraging the establishment of new businesses in the region. This dynamic promotes production specialization and strengthens business-to-business relationships, positively impacting the regional economy (Baldwin – Forslid 2000; Meersman – Nazemzadeh 2017; Ottaviano – Gianmarco I. P. 2008; Prus – Sikora 2021; Zhang – Cheng 2023). Connecting the area with the main transport corridors gives the region a competitive advantage and makes it more attractive for investors (Kadyraliev et al. 2022). In addition, aspects such as wider accessibility, shorter commuting distances, and the integration of roads into continuous corridors support socioeconomic development and the linking of regions into a wider economic context (Habrman – Žúdel 2017; Vinichenko 2021).

The European Union aims to improve the pan-European transport infrastructure through the Trans-European Transport Network (TEN-T), which is promoted as essential for improving territorial, economic, and social cohesion (European union 2021; Goldmann – Wessel 2020; The European court of auditors 2020; Rokicki et al. 2021). Incorporating this infrastructure into broader EU frameworks ensures that the benefits of these projects are not limited to national borders but extend to improving the overall economic cohesion across Europe. The Trans-European Transport Corridor also includes high-speed roads in the Czech Republic that connect the Czech Republic with the rest of

Europe. However, some empirical studies indicate that infrastructure investment in less developed regions can generate spillovers, particularly in the labour market, benefiting more developed neighbouring centres, especially over the long term (Kim – Han 2016; Ottaviano – Gianmarco I. P. 2008). These long-term impacts often involve shifts in the labor force, as new employment opportunities in newly accessible areas attract workers from surrounding regions, potentially exacerbating or alleviating local inequalities depending on the economic characteristics of the area. Therefore, it is essential to examine the long-term impact of infrastructure projects in regional centres close to the capital. The main aim of this paper is to identify the impact of highway construction on socioeconomic indicators in the investigated area.The study focuses on a 50.2 km long section of the highway connecting the capital of the Czech Republic, Prague, to the centre of the neighbouring district Hradec Králové opened in 2007. A key factor that may influence the socio-economic impacts analysed in this study is the proximity of Prague, the capital and largest economic centre of the Czech Republic, to the study area. Given the strong labour market, dynamic business environment and overall economic influence of Prague, the effects of the motorway on the study region are inevitably shaped by accessibility to the capital. The construction of the motorway infrastructure is intended to link two important locations in a fundamental way. In this case, the motorway section under study is the primary link between Prague, Hradec Králové and Pardubice. The completion of the D11 motorway section has not only served to extend the economic reach of Prague, but has also strengthened the integration of the region into the wider economic network and regional connectivity.This connection has an impact on mobility patterns, as people living near the motorway often commute to major urban centres, and their movement may not only be unilaterally oriented towards Prague, but may also include the opposite direction, as the connection to the wider motorway network enables movement to more distant areas and economically strong regions. The research provides a unique opportunity to explore the long-term effects of such infrastructure, leveraging nearly two decades of data to deliver a comprehensive analysis. The D11 highway section forms the main transportation axis of the Hradec Králové region and is also part of the most important road network, TEN-T, connecting major European agglomerations and industrial areas. One of the key areas of this plan is the integration of all regions and the enhancement of mutual accessibility and connectivity. Such infrastructure projects are not only critical to boosting regional economic performance but also to enhancing the overall resilience of the region to external economic shocks (Giannakis – Papadas 2021; OECD 2022). The project, which includes our studied area of the Hradec Králové region, aims to strengthen social, eco-

nomic, and territorial cohesion in the EU, create a unified transport space, ensure sustainable transportation, and reduce the environmental impact of transportation by lowering emissions and the carbon footprint.

The main objective of this study is to evaluate the socio-economic impacts of the newly built motorway section between Prague and Hradec Králové, focusing on key indicators such as unemployment, internal migration, housing development and firm formation. Using the proposed methods, we seek to determine whether the infrastructure investment has led to measurable economic benefits in the region of interest.

Owing to the methodological framework based on the difference-in-differences approach, supplemented by a synthetic control unit and the availability of data over a nearly twenty-year period, it was possible to conclude that investments in highway infrastructure can have a complex impact on the socioeconomic development of regions. The implementation of highway infrastructure as part of state investments does not inherently guarantee a competitive advantage or economic growth. However, under specific conditions, such infrastructure projects can contribute to fostering regional competitiveness and driving economic development. Highway construction can stimulate economic activity and increase the attractiveness of regions. The outcome of such investments can vary depending on the economic and geographical conditions of the region. The results show different effects in the long and short terms, especially in terms of the impact on unemployment and regional development.

Economic and social impacts of transport infrastructure development

The development of transport infrastructure is widely recognized as a significant driver of economic growth. Enhanced regional accessibility positively impacts the reduction of regional disparities, promotes economic development, and increases the competitiveness of regions, territories, or countries (Filčák et al. 2021; Shi et al. 2024; Wolny 2021). The expansion of transport networks leads to lower transport costs, which in turn generates agglomeration benefits (Krugman 1991). By reducing the costs of transportation, businesses are able to reach new customers, while consumers benefit from access to a broader range of goods and services (Prus – Sikora 2021). These benefits are not only felt at the local level but can also influence broader regional dynamics and support the integration of surrounding areas. Improved connectivity fosters an environment conducive to innovation, where firms within agglomerated regions can share resources and knowledge more effectively, thus accelerating regional economic development. This environment encourages entrepreneurial activities, which further boost the economic dynamism of the region. The creation of such innovative environments often encourages cross-sector collaboration and helps

businesses diversify their operations (Prus – Sikora 2021; Ahmed 2024). This advantage can also be observed at the national and international level, depending on the integration of regional networks. This concept is further elaborated in polarization theory, which argues that human capital tends to concentrate in developed regions because of reduced transport costs (Grzeszczak 1972; Perroux 1950). The creation of such centre promotes innovation and entrepreneurship, drives further economic growth, and attracts further investments as well as qualified workers to these regions. In the short run, investments in transport infrastructure lead to increased demand and job creation in construction and related sectors. It also reduces transport costs, and improve market access, thereby boosting the local economy (Gordon 2014; Lakshmanan – Chatterjee 2005; Rodrigue 2024). Unemployment in a region can also be largely affected by a lack of citizen mobility and the accompanying inadequate transport infrastructure (Meersman – Nazemzadeh 2017; Ottaviano – Gianmarco I. P. 2008; Zhang – Cheng 2023). Greater concentration of labour in a region due to better access to the labour market leads to savings in labour costs, input costs, and costs associated with the distribution of final outputs (Crescenzi et al. 2016; Prus – Sikora 2021; Gunasekera et al. 2008; Ottaviano – Gianmarco I. P. 2008).

However, while the benefits of improved infrastructure are evident, it is important to consider the potential drawbacks of such developments, such as the displacement of local businesses or the potential for economic disparities between areas that are more or less connected to the newly developed infrastructure. One of the challenges in analyzing the full impact of such developments is identifying and addressing the indirect effects that may take years to become apparent. Investments in infrastructure also facilitate the formation of agglomerations. Over the long term, these investments lead to structural change and integration, enhancing the attractiveness of regions and promoting economic growth through the concentration of firms and shared resources. This concentration results in stronger local markets and economies of scale (Baldwin – Forslid 2000; Lakshmanan – Chatterjee 2005; Meersman – Nazemzadeh 2017; Ottaviano – Gianmarco I. P. 2008; Zhang – Cheng 2023). Furthermore, the change in aggregate market demand caused by the development of transport infrastructure can stimulate economic growth by increasing demand for resources across various sectors, thereby promoting a multiplier effect within the economy (Lakshmanan 2011; Pradhan – Bagchi 2013). In the very long run, infrastructure development supports global distribution and sustainable regional competitiveness, leading to greater economic growth and improved living standards. These outcomes are also influenced by factors such as the institutional framework and human capital (Meersman – Nazemzadeh

2017). Infrastructure development can significantly support economic growth and productivity, particularly in areas where investment has been historically neglected. Developing countries and urban areas benefit the most, gaining improved access to markets. However, as the basic level of amenities increases and infrastructure expands, the impact on economic growth tends to diminish (Banister 2012; Crescenzi et al. 2016). Investments in transport infrastructure often stimulate population growth by making regions more attractive and creating new job opportunities, leading to migration (Rokicki et al. 2021; Rocha et al. 2023). Additionally, closer proximity to highway segments is associated with higher population growth and is likely to influence housing development patterns (Garcia-López et al. 2015).

Despite these advantages, infrastructure investments can also yield negative consequences. One notable issue is the crowding-out effect, where public investment replaces private investment, potentially hindering overall economic growth (Zhang – Cheng 2023). Furthermore, political interests and a weak institutional environment can result in inefficient project selection, corruption, and cost overruns (Cadot et al. 2006; Crescenzi et al. 2016). Another issue is the straw effect, which occurs when highway construction prioritizes more developed areas over less developed areas, thereby widening regional disparities (Ottaviano – Gianmarco I. P. 2008; Rokicki et al. 2021; Wolny 2021). Conversely, the proximity effect demonstrates that infrastructure projects can reduce unemployment in nearby areas, although this benefit diminishes with increased distance from the construction site (Habrman – Žúdel 2017). Given the uncertainty about the direction of long- and short-term effects, it is beneficial to examine how these effects manifest under specific conditions.

Methods

The difference-in-differences (DID) methodological framework was used in conjunction with the synthetic control unit method to establish a counterfactual. This approach allowed for the assessment of the causal impacts of the newly constructed highway section on selected socioeconomic variables. The DID-based methodological approach was applied to isolate the effect of highway section construction from other factors that could influence the socioeconomic indicators being examined. This method assesses these effects by comparing actual data with data from control groups and analysing the differences after the intervention—in this case, the opening of the highway section. The challenge in selecting a counterfactual is to identify a suitable control unit that meets specific criteria. A reliable counterfactual unit must closely mimic the socioeconomic and demographic characteristics of the study region prior to the intervention, in this case, before the construction of the highway section.

Additionally, the counterfactual unit should exhibit a stable trend in the variables of interest during the period preceding the intervention. It is also essential that the unit is minimally influenced by other external shocks that could bias the results of the analysis.

In these situations, the synthetic control method (SCM) provides a solution in the form of constructing a synthetic control unit that represents a weighted average of all available untreated controls, with the aim of achieving an optimal match to the treated unit in the preintervention period. The strength of this approach lies in its ability to account for regional heterogeneity by combining various untreated regions to build a synthetic unit that closely matches the study region's pre-intervention characteristics, allowing for more accurate comparisons and results. By using SCM, the analysis more effectively isolates the specific effect of the infrastructure investment on the studied socioeconomic outcomes, providing a clearer understanding of its true impact. The goal of the SCM method is to find weights w1, w2... wn for the control units such that the combination of these units best mimics the characteristics of the affected unit before the intervention (Abadie et al. 2010; Billmeier – Nannicini 2013; Lu 2021).

The results of the synthetic control unit were based on variables obtained from the Czech Statistical Office database at the ORP levels (CZSO 2024). Using Stata and the "Synth" command, the synthetic control units were estimated. This enabled the general prescription of the equation to be produced, which is specified for each ORP and the variable under study:

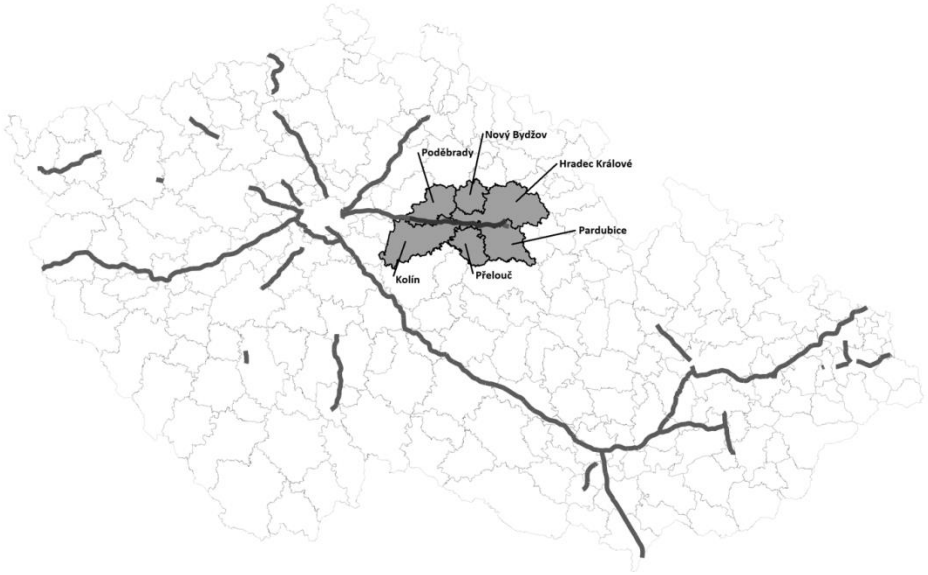
$$\Delta Y_{i,t} = \beta_0 + \beta_1 Synth(\Delta Y_{i,t}) + \beta_2 Dummy + \beta_3 Dummy * year + \varepsilon_{i,t}$$

where ΔYi, t is the dependent variable under study in region i at time t. Synth (ΔYi,t) is the first difference of the synthetic control for the individual variable under study. The dummy represents an artificial variable that takes a value of 1 for the period after the construction of the highway and 0 before it and then Dummy*year expresses the interaction term where the dummy variable is multiplied by the number of years since the highway opened.

The study is based on data collected from administrative units called "municipalities with extended jurisdiction", which act as administrative centres and have extended rights and responsibilities at the level of their microregions (hereafter referred to as ORPs). Out of 205 ORPs in the Czech Republic, six are the ORPs under examination: Hradec Králové, Pardubice, Poděbrady, Kolín, Přelouč, and Nový Bydžov. The selection of these ORPs (Hradec Králové, Pardubice, Poděbrady, Kolín, Přelouč and Nový Bydžov) is based on the geographical location, economic importance and potential impact of the newly built motorway infrastructure, and these are ORPs through which the D11

highway section passes directly, so they are located in its immediate vicinity. The newly constructed motorway section and the affected regions are shown in Figure 1.

Figure 1: **Motorway section and regions surveyed at ORP level**



Hradec Králové together with Pardubice represent the largest regional centres in the study area and also important economic centres, with Hradec Králové being directly connected to the new highway link. Poděbrady, Kolín, Přelouč and Nový Bydžov are located along the highway corridor and are affected by improved transport accessibility. Kolín plays a key role as an important industrial centre, especially thanks to the automotive industry. Poděbrady and Přelouč are areas with significant links to transport and logistics networks, and their economic development is closely linked to transit activities and labour mobility. Nový Bydžov represents a smaller regional centre whose economic dynamics can be significantly influenced by changes in transport infrastructure and improved accessibility to key economic nodes.

The remaining 199 ORPs are used as a base to construct a synthetic counterfactual. In selecting the variables, emphasis is placed on their potential to influence the indicators under study while ensuring that the variables are not interdependent or are already part of the included variables. The selected factors can be seen as proxies for the availability of human capital, population growth, the

related labour market situation, and regional development on the basis of the theory of location for cities (Ullman 1941), as listed in Table 1.

Table 1: **List of variables used to create the synthetic control unit**

Variable	**Unit of measurement**
Unemployment	Percentage
Completed dwellings per 1000 inhabitants	Number per 1000 inhabitants
Firms	Number
Inland migration	Number
Population density	Population/km^2
Number of villages in ORP	Number
Average age of men	Age
Average age of women	Age
Job vacancies	Number
Land area	Hectares

The DID method is employed to estimate the effect of infrastructure changes, incorporating panel regressions with time fixed effects. In addition, a robust standard error is used to enhance the reliability of the estimates.

This study examines the impact of infrastructure changes on economic indicators over the period from 2002 to 2021, using data at an annual frequency. This time frame is selected because of the complexity of the length of the data, making it suitable for this type of research. The analysis specifically focuses on the periods before and after the construction of the highway section. The original dataset consists of 20 time periods, but it is reduced to 19 periods after first differencing, with 5 periods occurring before the intervention and 14 after the intervention. The variables examined are detailed in Table 2. Given that the study focuses on 6 specific ORPs, there are a total of 114 observations for each variable examined.

Table 2: **List of variables studied**

Variable	**Unit of measurement**
Employment	Percentage
Firms	Number
Completed dwellings per 1000 inhabitants	Number per 1000 inhabitants
Firms	Number
Inland migration	Number

Results and discussion

The methodological framework outlined earlier provided a more comprehensive view of the relationship between the construction of the highway section and the socioeconomic development of the region, as evidenced by the regression estimates. Initial estimates were generated for each dependent variable individually examined in the analysis. The significance of these estimates lies in their ability to isolate the impact of the highway construction from other influencing factors, thus allowing for a clearer understanding of its role in regional development. In the first stage, these estimates were calculated without incorporating time fixed effects. The results of the regression estimates are presented in Table 3. For the unemployment rate, the synthetic control unit is a statistically significant predictor that contributes to forecasting the values of other variables. The positive and statistically significant value of the synthetic control unit suggests that the observed variable experienced a greater increase than would have been expected without the intervention. Following the construction of the highway, there was an initial rise in unemployment, which gradually diminished over time. The negative coefficient of the interaction term, which is significant at the 10% level, indicates that after the completion of the highway segment, unemployment decreased over time. The inclusion of the dummy variable in the model was shown to be statistically insignificant. This trend can be attributed to improved accessibility to major cities due to enhanced transportation infrastructure, which facilitates better access to jobs and attracts labour.

The results of the regression analysis for inland migration also demonstrated the statistical significance of the coefficient of the synthetic control unit. However, the negative coefficient of the dummy variable indicates that the construction of highway infrastructure has negatively impacted population growth in the region. Immediately following construction, population growth was lower than that of the counterfactual control unit. In contrast, the positive and statistically significant interaction term indicates a positive trend over time, suggesting that the initial negative effect diminishes over time.

These findings highlight the complex and temporal nature of migration patterns in response to infrastructure development. Although periods of regional adjustment following construction may initially slow migration, over time, improved access to economic opportunities and local amenities can make a region more attractive and support population growth.

Furthermore, the dynamics of the number of completed flats indicate a slower pace of growth immediately following the completion of construction.

However, this trend diminishes over time, with the difference gradually narrowing.

The final variable analysed was the rate of firm formation in the affected region. The statistical significance of the synthetic control unit was found to be low. While the positive value of the dummy variable suggests a potential positive effect from the construction of the highway section, this effect cannot be conclusively confirmed owing to the statistical insignificance of the coefficient. Statistical significance was observed only for the interaction term introduced in the model. The positive coefficient for this term indicates a potential increase in the rate of business creation over time.

This suggests that while the direct impact of highway construction on firm formation may not be immediately evident, its effects could materialize in the longer term, particularly in regions that experience economic restructuring or changes in the industrial landscape due to better transport links.

Table 3: **The results of the regression estimates without including time fixed effects**

	ΔUnemployment rate	**ΔInland migration**	**ΔDwelling**	**ΔFirms formation**
ΔSynthetic control unit	0.818 ******* (0.000)	0.666******* (0.000)	0.160 (0.738)	0.299 (0.158)
Highway completion	0.001 (0.560)	-214.562******* (0.001)	-1.689+ (0.061)	197.314 (0.223)
Time dependent effect	-0.000+ (0.061)	10.178***** (0.040)	0.134+ (0.072)	2.438******* (0.001)
Constant	-0.000 (0.291)	128.697******* (0.000)	0.724***** (0.047)	-226.885 (0.171)
N	114	114	114	114
R^2	0.775	0.436	0.075	0.089
Time fixed effects	NO	NO	NO	NO

p values are in parentheses.

+ p< 0.1, * p<0.05, ** p<0.01, *** p<0.005

To isolate the effects of the variables under study from other factors that vary over time but remain constant across ORPs, time fixed effects are introduced in the second set of models presented in Table 4. This approach allows us to account for fixed characteristics of each year that are consistent across the entire area under examination, such as the economic cycle, changes in legislation, or the overall development of the country.

For the unemployment rate, the synthetic control unit became statistically insignificant after the introduction of time fixed effects. In contrast, the time fixed effects, interaction term, and constant became statistically significant. The dummy variable indicated a higher rate of unemployment than did the control unit. However, when combined with the negative interaction term, the results suggest a diminishing effect of the increased unemployment rate over time. The time fixed effects point to a general trend of declining unemployment.

The introduction of time fixed effects revealed that the impact of highway construction on internal migration was either minimal or overshadowed by other, presumably stronger, factors. The coefficients of all the variables, except for the synthetic control, were found to be statistically insignificant. This result suggests that neither the direct effect of highway construction nor its effect over time was clearly established in this case. The introduction of time fixed effects also influenced the results regarding the growth rate of the completed dwellings. This impact has not been clearly demonstrated, and the effect of time factors has been shown to be variable. It is likely that other, more significant factors not accounted for in the model overshadow the effect of highway construction itself.

Regarding the rate of firm formation, the coefficient of the artificial dummy variable indicates a potential, though statistically insignificant, decline in the rate of firm formation following highway construction. Additionally, the interaction term does not indicate a statistically significant relationship between the rate of firm formation and time. Different years show varying effects, which are statistically insignificant in most cases.

Table 4: **The results of the regression estimates including time fixed effects**

	ΔUnemployment rate	**ΔInland migration**	**ΔDwelling**	**ΔFirms formation**
ΔSynthetic control unit	0.091 (0.656)	0.606******* (0.000)	0.383 (0.302)	-0.227 (0.457)
Highway completion	0.092******* (0.000)	-591.611 (0.677)	-5.695 (0.486)	-769.559 (0.208)
Time dependent effect	-0.007******* (0.000)	42.686 (0.692)	0.577 (0.358)	56.162 (0.198)
Constant	0.004****** (0.006)	-48.512 (0.764)	-1.561******* (0.000)	-14.636 (0.730)
N	114	114	114	114
R^2	0.871	0.562	0.243	0.364
Time fixed effects	YES	YES	YES	YES

p values are in parentheses.

+ p< 0.1, * p<0.05, ** p<0.01, *** p<0.005

The results for the unemployment rate revealed a temporary increase immediately following the completion of the highway. However, this effect has diminished over time. Furthermore, a short-term positive effect was observed during the construction itself, primarily because this phase requires the involvement of a large workforce, including construction workers, surveyors, engineers, and construction managers. However, these findings are not consistent with those of Habrman and Žúdel, (2017), who reported a positive impact of highway construction on unemployment as a function of commuting distance. Their results suggest that areas close to the constructed section experience a positive effect on the unemployment rate. Rather, the results align with the so-called "straw effect" reported by (Kim – Han 2016; Ottaviano – Gianmarco I. P. 2008; Rokicki et al. 2021; Wolny 2021). This effect refers to a preference for areas with larger market sizes at the expense of less developed locations, associated with easier migration of economic agents to more developed areas owing to reduced barriers from improved infrastructure.

Empirical studies suggest that investment in highway infrastructure could lead to the emergence of agglomerations (Baldwin – Forslid 2000; Ottaviano – Gianmarco I. P. 2008; Zhang – Cheng 2023). These studies observe a strategic relocation of firms migrating to these more attractive areas. This trend is fur-

ther supported by Lakshmanan and Chatterjee (2005) and Meersman and Nazemzadeh (2017), who find that such effects are primarily visible in the long run. However, the regression model of firms did not demonstrate a significant effect on their establishment rates. The research also indicated a slowdown in the establishment rate of firms, despite a gradual weakening of this slowdown over time. In the context of highway construction, the observed results do not fully align with the expected outcomes. Therefore, a potential direction for future research could involve separately examining the impact on economically significant ORPs versus focusing solely on smaller ORPs whose economic importance in the region bordering the highway segment is less pronounced.

The increased dynamism in residential development can be considered a broader economic benefit that may result from the enhanced attractiveness of the area. The analysis of this indicator revealed an important finding: the interaction between highway construction and time did not significantly impact the rate of housing unit completion. It was evident that the effect of the highway segment's completion was felt immediately, influencing the construction of new housing units, the attractiveness of the area, and employment opportunities, all of which contributed to an influx of residents and overall population growth in the region. The survey results indicated lower population growth immediately following highway construction, but this growth has gradually increased over time. This confirms that the impact of such investments can have a time lag. The initial lower population growth following highway construction could be attributed to the presence of two economically strong administrative centres, Hradec Králové and Pardubice, which may have experienced an outflow of people to other areas.

In the model where time fixed effects were used to isolate the variable under study from other time-varying factors, the coefficients were not statistically significant. This suggests that the effects of highway construction might have been too small to detect or were potentially overshadowed by other factors, which could be explored in further research.

The direct highway connection with the capital city, Prague, also raises questions about the extent to which proximity to the capital may have influenced the results of our study. The regions affected by the new highway section gained improved transport links to Prague and other economically significant cities, reducing traffic barriers and enhancing overall accessibility for nearby regions. The observed straw effect, which refers to a preference for more developed areas with larger market sizes for highway construction at the expense of less developed regions, could explain why the effects differed from initial expectations.

Conclusion

This study aimed to investigate the effects of highway infrastructure construction on specific socioeconomic indicators in regions impacted by the expansion of the highway network. Given that the impact of such construction often manifests over longer time frames, our research also explored how these effects unfold over longer periods. The findings suggest that the construction of the highway section has the potential to positively influence socioeconomic development in the investigated region of Hradec Králové and the surrounding municipalities with extended jurisdiction.

However, in the short term, highway construction in this region seems to be associated with the straw effect, which makes developed areas more accessible and attractive. This was evident when indicators such as unemployment, internal migration/population growth, and the formation of agglomerations were examined. An increase in unemployment in the analysed region was observed immediately after the highway section was completed, whereas the positive effects and a reduction in the elevated unemployment rate became apparent only over time. This reflects the need for careful consideration of infrastructure development in the context of long-term planning and regional development strategies. The short-term effects observed in this study highlight the complexity of infrastructure projects and the need for policymakers to consider both immediate disruptions and longer-term benefits. Contrary to expectations, infrastructure development did not result in the formation of agglomerations or an increase in the number of firms in the region. Additionally, highway construction initially led to a significant slowdown in the rate of firm establishment, although this effect weakened over time.

The construction of a highway section may increase the attractiveness of the area and support the dynamics of residential development. However, the research results suggest that the positive effects of highway construction did not materialize in this case. This suggests that while urbanization and population growth potential are present, these outcomes depend on the presence of other complementary factors to fully achieve the desired benefits. This is also linked to population growth and development after construction. The findings indicated lower growth dynamics, which increased over time.

Our research shows that the positive effect of construction does not have to occur automatically. The results indicate that highway construction can stimulate economic activity and increase the attractiveness of regions, but the strength of this effect, or rather its direction, may vary depending on the size, location, and especially the economic strength of specific regions and the neighbourhoods of other attractive centres. In particular, areas with already

strong economic foundations and high demand for services and housing tend to experience a more immediate positive effect from such developments, while less economically integrated areas may face challenges in capitalizing on the infrastructure improvements.

In conclusion, the economic development of a region and its geographical location are crucial for assessing the impact of highway infrastructure construction. These factors have the potential to influence the impacts of construction and the expected outcomes and benefits. Therefore, it is important to consider the specifics of individual regions when designing and implementing such projects. Furthermore, policymakers need to focus on long-term planning to ensure that infrastructure improvements promote sustainable and inclusive economic growth, especially in peripheral regions where the benefits of such projects may take more time to become evident.

The current results and findings from this study can provide valuable insights for regional and national economic policymakers, as well as for government officials dealing with transportation issues, transport infrastructure, and overall optimization.

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