Road to Crime: Expressway Connections and Child Trafficking*

Yu Bai[†] Yanjun Li[‡] Xinyan Liu[§] Yajie Sun[¶]

Abstract

Child trafficking is a long-lasting social issue in China. We argue that abducted children increase as an indirect and unintended consequence of improved urban infrastructure, such as the construction of expressways that facilitate the expedient transfer of victims between cities. To identify the causal relationship, we combine family-reported incidents of child abduction with geo-referenced data of China's highway routes to explore the impact of expressways on connected cities in comparison to unconnected cities using a difference-in-differences approach and city-pair matching strategy. The results support our assumptions and are robust after addressing the concerns regarding the endogeneity of route placement and staggered treatment timing. The expanded demand side of the trafficking market and enhanced rural-urban migration, which increases the public safety risks, could account for the mechanism behind the phenomena.

JEL classification. H54, K42, O15, O18, R23, J13

Keywords. Child trafficking; Expressways; Transport infrastructure; Illegal behaviors; China.

---

*We gratefully acknowledge comments from Anna Aizer, Tatyana Avilova, Jun Goto, Drew Griffen, Juanna S. Joensen, Yoko Kijima, Chiu-yu Ko, Wen-Chi Liao, Chiaki Moriguchi, Alistair Munro, Masaki Nakabayashi, Masahiro Shoji, Kazushi Takahashi, Ruiyichi Tanaka, Tong Wang, Xiaoyu Xia and participants at the various workshops and conferences for many valuable comments and suggestions.

[†]Institute of Social Science, the University of Tokyo. Email: yu.bai@iss.u-tokyo.ac.jp

[‡]Hitotsubashi Institute for Advanced Study, Hitotsubashi University. Email: yanjun.li@r.hit-u.ac.jp

[§]Department of Decision Sciences and Managerial Economics, the Chinese University of Hong Kong. Email: liuxinyan@link.cuhk.edu.hk

[¶]Institute of Economics and Finance, Nanjing Audit University. Email: sunyajie@nau.edu.cn

1 Introduction

Trafficking in children is a serious humanitarian problem, in both national and international contexts, that damages social harmony and sustainability and leads to considerable tragedy. Based on the statistics from the International Labor Organization, at least 1.2 million children were trafficked in 2000, primarily, but not exclusively, in developing countries (Dessy & Pallage, 2006). According to the United States Department of State, an estimated 20,000 children are trafficked in China every year. Child trafficking is a complicated process involving abandonment, abduction, the illegal trade of children, and even corruption. Cultural and occupational risks, as well as policy and legal loopholes, increase the demand for child abduction.[1] On the supply side, children are typically kidnapped by traffickers and can be transferred multiple times before being illegally adopted, making it difficult for law enforcement officials to crack cases of trafficking. As a result, child trafficking remains a persistent problem in China. To better solve this issue, it is important to analyze the factors that can increase a child's risk of being abducted and to investigate the mechanisms behind this phenomenon. In this study, we assess the link between the occurrence of child trafficking and the rapid expansion of expressway connections in China.

The incidence of trafficked children is more likely to be associated with an increased demand for child labor (Edmonds, 2007, 2010) and sexual exploitation (Arunachalam & Shah, 2013; Edlund & Korn, 2002; Li et al., 2018) in other developing countries; however, the phenomenon of child trafficking differs in China, where illegal trade of both boys and girls is common, although the causes of the two cases are different. Owing to thousands of years of feudal thinking in China, many families have strong "son preferences," as confirmed in the literature (Almond et al., 2019), causing the price for boys to be much higher than that of girls, as some parents buy sons to continue the family line and increase family power. Moreover, land acquisition allowances are often calculated according to the number of male household

[1]To legally register an abducted child, the purchased children's new parents collaborate with traffickers to exploit loopholes in China's child adoption regulations. The parents either falsely claim to have found an abandoned child after the purchase or traffickers function as the child's foster caregivers using artificial documentation. These methods usually deceive the registration bureaucracies to obtain legal household status for the children.

members; thus, acquiring boys could help the household obtain additional land in some rural areas. In contrast, girls are trafficked as child brides or into bonded servitude. For instance, in Fujian and Jiangxi provinces where men engage in high-risk jobs such as fishing, families purchase girls to serve as future daughters-in-law and household help (Chen et al., 2015). Additionally, China's one-child policy is considered to be a significant contributor to the incidence of child abandonment and abduction (Bao et al., 2019; Edlund et al., 2013). Harsh penalties for births beyond the quota, including fines, potential loss of employment, and denial of promotion opportunities (Ebenstein, 2010; Howden & Zhou, 2014), increase the demand for child trafficking. Determinants on the supply side include the victimization risks in the hometown regions, which are found to be highest in places with a high rate of in- and out-migration (Mahmoud & Trebesch, 2010) and with a vast and heterogeneous population but poor public security conditions (Bai et al., 2022); namely, "traffickers fish in the stream of migration" (Coomaraswamy, 2001, p.3).

The intermediaries that link up the demand and supply side of child trafficking include traffickers and trafficking networks. The traffickers often trick, force, or persuade children to leave their homes (mostly at the train station or on their way commuting to and from school) and are moved or transported. Besides high demand and attractive profits, less severe legal penalties and enforcement have motivated trafficking gangs to actively engage in these underground activities (Cai, 2016). In the Crime Code prior to 1997, child abduction cases were classified as human trafficking, and the punishment was fixed-term imprisonment of up to 5 years, while the 1997 Crime Code separates child trafficking, stipulating punishment of 5–10 years in prison and a fine. Although the new law increases the penalties for child trafficking, it remains lenient for traders and is minimally effective in deterring child abduction.

Child trafficking networks are well-concealed and complex, widely covering most cities (Wang et al., 2018). Many traffickers would choose to transfer them through intercity or interprovincial roads using a private car or taking public buses to privately transfer trafficked children to other cities. Unlike taking planes or trains between regions, where strict security checks occur at transportation hubs (e.g., airports and train stations), almost no personal identity checks are conducted at toll stations on highways or other national/provincial roads. Subsequently, it is likely that enhanced connectivity between cities in the form of highways would facilitate the illegal transfer of children across regions, decreasing the cost of executing the crime. Accordingly, we hypothesize that child trafficking becomes more severe in regions that are connected to expressway networks.

To test our hypothesis, we collect family-reported incidents of trafficking in children aged 0–16 obtained from the website Baby Come Back Home (BCBH) and combine them with geo-referenced GIS shapefile format data of China's highway routes obtained from the Spatio-Temporal Expressway Database (STED). We then construct a panel between 1999 and 2014 with city-level and temporal variations to explore the impact of expressways on connected cities in comparison to unconnected cities using a generalized difference-in-differences (DID) approach. To address the endogenous placement of routes, we further restrict the sample to targeted cities of the National Trunk Highway System (NTHS) and use the city-pair matching strategy to reinforce our conclusion. We also supplement the baseline results using historical road connections and cities' geographic slopes as instruments for current expressway connections.

We discovered that the connection of expressway connections dramatically increases the prevalence of child trafficking, which is a severe intercity crime. The baseline results suggest a strong positive correlation between expressways and incidents of child trafficking in the connected cities and are robust to all challenges in terms of identification. The mechanism behind this is that expressways facilitate transportation between regions, expanding the demand side of the trafficking market. Moreover, the construction of expressways has motivated industrial transformation alongside the routes, which has raised the need for inexpensive labor from migrant workers in some medium-sized cities; rural-urban migration was enhanced. In rural areas, it increases the chance of violent delinquency by giving rural parents greater job options to relocate, which reduces parental care for children who are left behind. In urban areas, more low-skilled labor flooded in, alleviating the risks to public safety and increasing the likelihood of child trafficking.

Our study contributes to the literature on two grounds.

There are few quantitative studies regarding how trafficking networks function in China and worldwide. Among the limited empirical works, the direct triggers of child abduction include poverty, legislation and law enforcement, and the pecuniary returns of trafficking; however, the deeply rooted traditional, cultural, institutional, and socioeconomic factors behind these phenomena deserve more attention. Aspects of the reasons behind child trafficking have been explored in the literature, such as political instability or multiethnic conflicts (Tiefenbrun, 2007), China's birth restriction policy (Bao et al., 2019; Edlund et al., 2013), the patriarchal culture (Wang et al., 2018), and social acceptance of child labor and child marriage (Kolk & van Tulder, 2002). Although most of these reasons are related to the demand side, a small set of papers examine the determinants in the supply side, namely the risk of being abducted in hometown regions (Bai et al., 2022; Shoji & Tsubota, 2022). Our paper provides a new perspective on child trafficking, examining the role of a key factor linking the demand and supply sides – the transportation networks. We contribute to the literature on the economics of crime by using a unique dataset to uncover regional illegal behaviors, demonstrating how changes in transportation feasibilities and costs correlate with the incidence of crimes. To the best of our knowledge, this is also the first study to document the relationship between the construction of urban infrastructure and child trafficking.

This paper also provides novel evidence on the detrimental byproducts of transport infrastructure improvement in developing countries. Its positive impact on economic development is demonstrable. Road connections could raise the level of GDP per capita across sectors (Banerjee et al., 2020), promote poor rural counties' economic growth (He et al., 2020), stimulate industrial sorting along with the network, and advance a more efficient allocation of industries (Ghani et al., 2016). Conversely, the negative impact is primarily related to the fact that transport infrastructure development has not reduced the disparities in real income and urbanization across regions (Bosker et al., 2018; Roberts et al., 2012). Instead, it has leveraged regional inequalities by lowering economic growth among non-targeted peripheral counties (Faber, 2014), causing hinterland cities to lose manufacturing industry and economic activities (Baum-Snow et al., 2020) and products with low and medium weight-to-value ratios to decentralize (Baum-Snow et al., 2017). Additionally, transport infrastructure improvement may promote economic development at the cost of environmental pollution (He et al., 2020). Our paper follows the literature and analyzes how highway construction may facilitate cross-regional crime, allowing a further investigation of prevention strategies and contributing to the literature on the various effects of improved transportation infrastructure and market access on urban development.

The remainder of the paper is organized as follows. Section 2 describes the background and our variables of interest. Section 3 presents the empirical strategy. Section 4 reports the empirical results. Section 5 discusses the mechanisms, and Section 6 concludes.

2 Background and data

2.1 Road network expansion

Since the 1984 completion of the first expressway connecting Shenyang and Dalian ended the absence of highways in mainland China, the growth of expressways in China has rapidly progressed. The expansion of China's national expressway network under the National Trunk Highway System (NTHS) took place in several stages. The 7–5 expressway network plan, including seven horizontal and five vertical axes across the country, was approved in 1992 to connect all cities with a registered urban population greater than 500,000 and all provincial capitals with modern highways (Faber, 2014). This plan was largely completed by 2007, 13 years ahead of the original 2020 deadline.

Given that the progress in constructing the 7–5 network is ahead of time, in 2004, the State Council approved another blueprint for highway construction called the 7–9–18 networks. It comprises seven routes from Beijing to other major cities, nine vertical axes, and eighteen horizontal axes. This system aims to expand the highway network to smaller cities; more specifically, to connect all cities with a registered urban population greater than 200,000.[2]

[2]Some port cities, tourist cities, and railway hubs are also targeted by this network plan.

Appendix Figure A.1 shows the rapid growth of expressways in China during these programs. In 1996, only 62 cities in Mainland China were connected by expressway lines, and the combined length of all lines was below 4,000 kilometers. By the end of 2013, 308 cities had a total of 104,438 kilometers of expressway lines constructed.

As noted, our geo-referenced expressway network is obtained from the Spatio-Temporal Expressway Database (STED). This database provides an accurate GIS shapefile data format on China's highway routes for the years 1998, 2000, 2001, 2003, 2004, 2006, 2007, 2009, 2010, and 2013, facilitating further processing using ArcGIS and has been used for several frequently cited studies of China (Faber, 2014; He et al., 2020). To construct this database, the Australian Consortium for the Asian Spatial Information and Analysis Network (ACASIAN) Data Center at Griffith University digitized dozens of high-resolution road atlases published by China's national and regional road transportation authorities. These atlas sources make it possible to select the network segments of the 7–5 and the 7–9–18 systems that were open each year for the period examined. Figures 1(a) and 1(b) depict the national expressway network in 1998 and in 2013, respectively, demonstrating the rapid expansion of the network during this period. By projecting the STED database to a city-level boundary map, we are able to identify the year in which cities were connected and examine the differences in criminal activity between connected and unconnected cities before and after the actual construction of highways.[3]

We define cities located on expressway routes as the treatment group and those not connected as the control group. To sum up, for the baseline analysis, we use a lagged term of the explanatory variable and focus on the period of highway construction between 1998 and 2013, a period corresponding to the implementation of both the 7–5 and the 7–9–18 plans and rapid expressway development.

[3] We use the city-level boundary map for the year 2010.

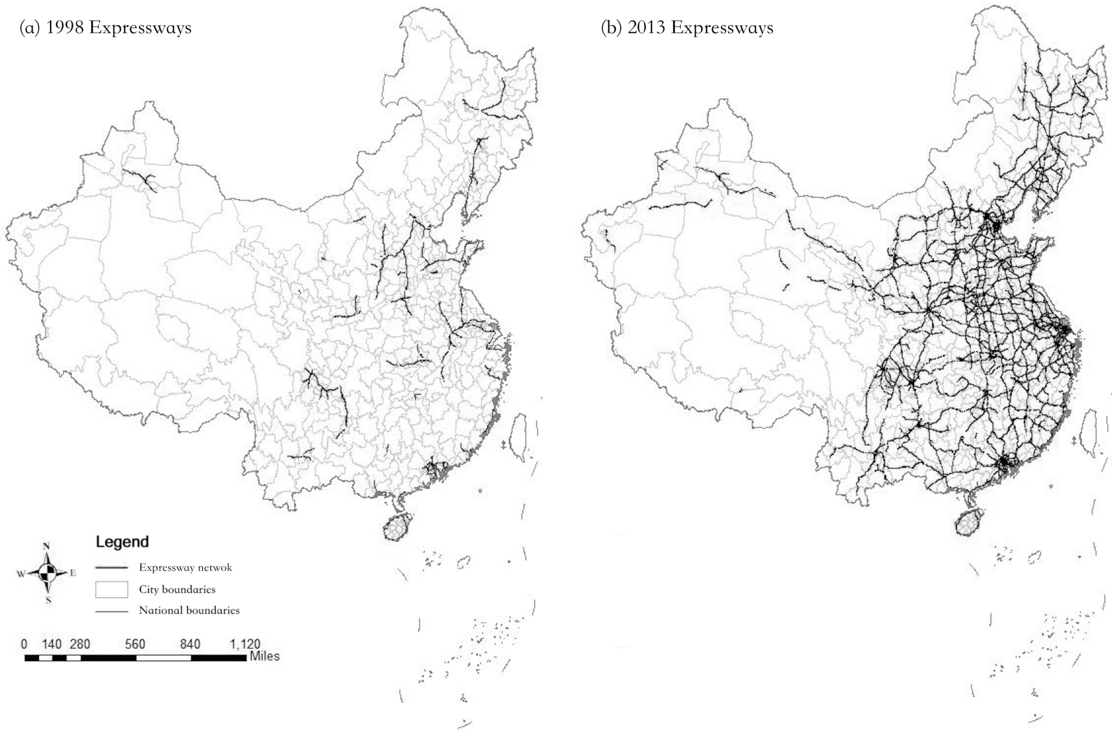


Figure 1: Expressway Network in China (1998 and 2013)

Note: The figures present the expansion of expressway networks between 1998 and 2013.

2.2 Data on trafficked children

Information on missing children is quite limited, as no officially collected statistics on child trafficking exist, as with other underground and illegal activities in China. We follow Wang et al. (2018) and Bao et al. (2019) using family-reported records on missing children to measure trafficking in children. Our information is from the Baby Come Back Home (BCBH; http://www.baobeihuijia.com) website, the largest online platform sharing information on missing children.[4] Both families looking for missing members (i.e., family-reported cases) or victims seeking biological parents (i.e., child-reported cases) can access the website to report the information including the name, gender, date of birth, date, and location of the disappearance, either online or via a hotline. The staff of the organization is then assigned to verify posts by cross-validating the information with the local police to reduce the problem

[4]We consider the challenges of underreporting and misreporting in Section 4.2.2.

of misreporting to a minimum. After this procedure, reported cases are officially published on BCBH for visitors to access and review. Appendix Figure A.2 presents an example of a family-reported abducted child in the BCBH community.

Importantly, to differentiate the posts from BCBH, we do not include cases labeled with the keywords "abandoned" or "sold for adoption" to exclude cases in which children were voluntarily surrendered, denoted as "child abandonment." That is, we only include cases in which the child was involuntarily separated from the family, which are classified as "child abduction." We then extract the city name of the address in text format for each incident and aggregate the data to city-level units.[5] The age when a child went missing is generated using the difference between the year of the incident and the child's birth year. We only count children whose age was lower than 16 when they went missing, and further exclude cases missing important information, particularly when a location fails to identify the city. These restrictions resulted in a total sample of 19,236 registered cases, among which 14,147 were published by families to find missing children and 5,089 were from missing persons to look for their families. We only include cases belonging to the first type in the benchmark analysis because some missing children were too young at the time of their abduction to recall accurate information regarding the location and the year of disappearance many years after the incident.

Appendix Figure A.3 plots the annual trend of family-reported abducted children collected from BCBH. One thing to note is that, although the website was established and became publicly available in 2007, posts are not limited to trafficking cases after 2007. In other words, families could also recall and post for their family members who went missing in previous years, and there is no restriction on reporting time (the incident may happen many years ago; the earliest case happened in 1926). As shown in the figure, the solid line shows the trend for the overall child trafficking cases, while the dashed and dot lines show the trend for trafficking in the treated and control cities, respectively. The solid line shows that the trend fluctuates, with the first peak coming in the 1960s. This could be explained by China's Great Famine (1959–1961), during which poverty largely triggered the illegal trade of children (Anderson

[5] Because of the incomplete information in many reported cases, city-level analysis is the most disaggregated level of measure on which we can focus.

& Ray, 2010; Dessy et al., 2005). Then, the trend fell back to 1980, when the number of child abductions began to rise again. This dramatic increase in cases in the 1980s may be the effect of the one-child policy and the land reform, which echoes the finding of Bao et al. (2019). Following the policy, the trend continued to shift upward until around 1997, when the number of cases began to decrease, largely due to the change of rules in the Crime Law as described in Section 1. Both treated and control cities followed this overall trend in terms of child trafficking.

To avoid the impact of other concurrent policies confounding our results, we focus on the period between 1999 and 2014 as our main estimation period, matching it with the lagged expressway data. As shown in Appendix Figure A.3, although the total number of child trafficking gradually decreased because of the changes in legal enforcement in 1997, most of the child trafficking cases come from our treated cities, compared to control cities. Therefore, we can still evaluate the factors that lead to regional variations in trafficking. Table 1 summarizes the descriptive statistics of child trafficking cases in addition to other important variables in the period of interest of this paper.

The city-level geographic distribution of the selected cases is shown in Figure 2, revealing the geographic concentration of our child trafficking cases. The top six child abduction outflow locations at the province level are Guangdong, Guizhou, Sichuan, Yunnan, Henan, and Shaanxi, accounting for 53% of reported cases in the BCBH database but only 29% of the total population in China. Both the location of the disappearances and the destinations in this period are medium-sized cities, which, as shown in Section 2.1, were explicitly targeted in the highway construction plan. In particular, these cities highly overlapped with the cities in the second stage of the NTHS, which targeted second-tier cities situated in the central and western regions of China.

Table 1: Summary statistics of the key variables

	Obs.	Mean	Std. Dev.	Min	Max	Data source
Outcome variables						
#Incidents of child abduction	5,904	0.787	1.905	0	31	
#Abducted boys	5,904	0.476	1.377	0	27	BCBH
#Abducted girls	5,904	0.310	0.789	0	11	
Explanatory variables & instrumental variables						
Connected (1=Yes; 0=No)	3,690	0.661	0.473	0	1	
ln Market access	3,690	-2.179	10.33	-18.42	5.89	STED
ln Market access (within prov.)	3,690	-2.736	9.984	-18.42	5.51	
ln Market access (to ports)	3,690	-3.681	9.448	-18.42	5.12	
Connected 1962 (1=Yes; 0=No)	369	0.780	0.414	0	1	Baum-Snow et al. (2017)
Ruggedness	340	763.6	1013.2	1.26	5045.2	
Time-variant city-level characteristics						
Luminosity	4,905	0.502	1.445	0.00001	19.87	DMSP/ OLS
ln Population	4,346	0.429	0.384	0.003	11.51	
ln Gov spending	4,308	7.24	1.34	2.66	11.51	
ln Infrastructure investment	4,269	8.73	1.29	5.15	12.18	China City Statistical Yearbook
ln Wage	4,402	9.87	0.672	2.28	12.68	
% of primary industry	4,394	0.046	0.092	0.001	0.844	
% of tertiary industry	4,383	0.432	0.137	0.045	0.834	
% of tertiary industry	4,426	0.522	0.129	0.099	0.948	

Notes: This table presents the summary statistics (number of observations, mean, standard deviation, minimum value, and maximum value). Our main outcome variables are the number of family-reported incidents of child abduction, with abducted boys and girls reported separately. The data source for abducted children is the Baby Come Back Home (BCBH) website. Our main explanatory variables are *Connected* which indicates whether a city is connected to an expressway network or not. We also include the metric of the natural logarithm of market access (MA), which is measured by the connectivity of one city to other cities weighted by the population size of those cities it is connected to. This value can be zero if the city has not been connected by the highways. The data source is from Spatio-Temporal Expressway Database (STED). Our instrument variable is *Connected 1962* and *Ruggedness*, which are obtained from Baum-Snow et al. (2017) and ArcGIS software, respectively. Our time-variant control variables are luminosity data from The Defense Meteorological Program–Operational Line-Scan System (DMSP–OLS), and the rest of the socioeconomic variables are from the China City Statistical Yearbook.

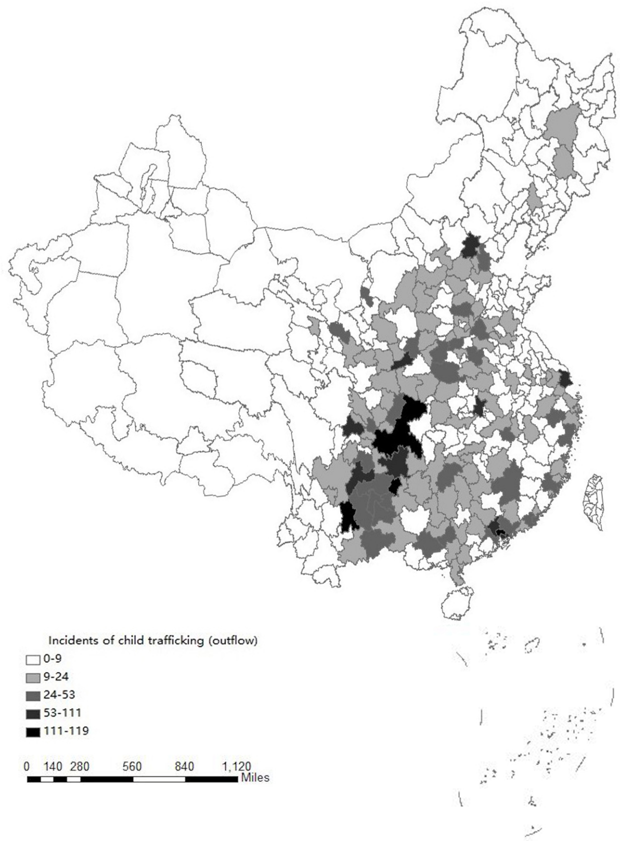


Figure 2: Distribution of family-reported child abduction in China (1999–2014): Hometown

Note: The figure presents the geographic distribution of abducted children's hometown cities (i.e., outflow cities), obtained from family-reported records. The distribution of the inflow cities (cities to which the abducted children were transferred) reported by children are presented in Appendix Figure A.4.

3 Identification strategy

Taking advantage of the regional and temporal variation in expressway network implementation, we next estimate the effect of expressways on incidents of child trafficking in connected cities with respect to that in unconnected cities by exploiting a time-varying DID specification:

$$\textit{Trafficking}_{i,t} = \alpha + \beta \textit{Connected}_{i,t-1} + \lambda_i + \theta_t + \epsilon_{i,t}$$

where $\textit{Connected}_{i,t-1}$, the main explanatory variable, is a dummy variable that takes a value of one if city i is connected to the expressway in year $t-1$, and zero if otherwise.

$Trafficking_{i,t}$ approximates the yearly statistics and counts the total cases of missing children in city i in year t. λ_i captures time-invariant characteristics at the city level. θ_t is the year fixed effects that account for annual trends that apply to all cities. $\epsilon_{i,t}$ is the error term, and robust standard errors are clustered at the city level.

We also follow Donaldson & Hornbeck (2016) and use market access measures to capture the effect of transport construction. The market access of a city is not only decided by its connectivity to other cities but also by the market size of the cities to which it is connected. We adopt city-year level market access (MA) as our alternative regressor, which takes the following form:

$MA_{it} = \sum_{i'}^{i' \neq i} T_{ii't}^{-\theta} * pop_{i't}$

where i' stands for the destination city, t represents the periods, and $pop_{i't}$ is the population size in destination city i' in year t. The highway network is translated into travel costs, measured by a power decay function. In this function, θ is the power decay parameter estimated based on Jing & Liao (2022) and determines how *MA* power decays with travel time along with the expressway network.[6] $T_{ii't}$ approximates the travel time in minutes across the expressway network to targeted city i'. To calculate the travel time in minutes, we assume the expressway has a conventional speed of 100 km/h. The *MA* variable, thus, is intuitively interpreted as the travel cost weighted by the population at destination city i'.

One remaining concern for identification is that although the decision-making process is determined by the upper-level government, the placement of routes may not be entirely orthogonal to unobservable determinants. Some of these are addressed through the inclusion of city-fixed effects, such as geographic features, economic endowments, and political and cultural importance; however, features that vary over time, such as local economic and political shocks, lead to endogeneity issues. Our first attempt to deal with this problem follows Lin (2017) in restricting our study sample to NTHS-targeted cities, as this group of cities shares a higher level of homogeneity compared with cities that were not included. The analysis identifies the effect driven by the timing of each city's connection to the expressways,

[6]More details are reported in Appendix B.

which is determined by idiosyncratic elements, such as the length of the line, infrastructural construction cost, and engineering difficulties.

Moreover, the endogeneity concern is further alleviated using city-pair matching techniques. We match each eventually connected city with an unconnected city (i.e., city-pair) within the same province. The city-pair matching could require city pairs to be either geographically contiguous or experience a similar level of past accumulative child trafficking between 1960 and 1990 within the pair. Then we apply DID estimators to city pairs, as reported in Section 4.1.1. This procedure makes the connected and unconnected cities in pairs more comparable, sharing common support regarding initial factors correlated with child trafficking.[7]

Next, we follow the rich literature on Chinese urban studies (Baum-Snow et al., 2017; Duranton & Turner, 2012; Duranton et al., 2014; Zheng & Kahn, 2013), using historical road connections in 1962 and city ruggedness as our instrumental variables (IVs). Although a set of confounders that biased our estimates still may exist, we account for their effects using a rich set of time-varying, city-specific covariates, and year-specific trends, which largely alleviate our concerns.

Finally, we consider concerns regarding the application of staggered DID and dynamic treatment effects (de Chaisemartin & D'Haultfœuille, 2020), using an event-study model to examine whether the intensity of child trafficking in connected cities was affected prior to the actual highway connection.

[7]The balancing test of our matched city pairs using the second method is reported in Appendix Table A.1.

4 Empirical results

4.1 Baseline results

4.1.1 DID and city-pair matching

Table 2 presents the baseline DID estimates. Controlling for city and year fixed effects, we find that highways significantly lead to 0.36 cases of child abduction (54% of the mean of the outcome), as reported in column (1). Restricting our sample to targeted cities of the NTHS and further including province-year fixed effects do not alter the results, as suggested by columns (2) and (3). The magnitude we obtain is slightly larger than what is arrived by (Bao et al., 2019) with a coefficient of 0.3 when evaluating the effect of China's One-Child Policy on child abandonment. Columns (4)–(6) present the coefficient estimated from the specification in column (3), with three *MA* measures as the main explanatory variables, to consider the market size of the destination cities. Among these, column (5) considers only destination cities within the same province, and column (6) considers the *MA* to the nearest ports. The results are consistent, indicating that a 1% increase in the *MA* is associated with an additional 0.02 cases, regardless of the measure used. Excluding the zero cells of our outcome variable or changing the outcome variable to a form that takes the population of each city into account does not alter the conclusion, as suggested by Appendix Table A.2. Exploring the connectivity of inflow cities elicits the same conclusion. We re-run the specification used in Table 2 by replacing the outcome variables from the number of children trafficked and transferred out to the number of children transferred in. As suggested by Appendix Table A.3, when a destination city is connected by the highway, the number of abducted children being transferred to that city also increases.

We then combine the DID specification with city-pair matching methods. Matching methods based on geographic adjacency or similar past child trafficking trends are used, and their corresponding results are presented in columns (1)–(3) and (4)–(6) in Table 3, respectively. Regardless of the matching methods used, the results are robust after the inclusion of city-pair or city-pair-year fixed effects and changes in clustering level at the city level or province-pair level. All results are consistent across all baseline specifications.

Table 2: Baseline results: DID specification

	# incidents of child abduction in year t					
	all cities	targeted cities				
	(1)	(2)	(3)	(4) overall	(5) within prov.	(6) to ports
Connect	0.355***	0.508***	0.422***			
	(0.129)	(0.175)	(0.135)			
ln Market access				0.017***	0.018***	0.019***
				(0.006)	(0.007)	(0.007)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓				
Province × year FE			✓	✓	✓	✓
# Obs.	3690	2790	2730	2730	2730	2730
# Clusters	369	279	273	273	273	273

[1] The standard errors clustered at the city level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

We then perform three additional tests on the baseline results shown in Table 3. First, as a placebo test, using a dummy variable indicating the high-speed railway connections between 2005 and 2015 as our explanatory variable does not lead to a similar pattern of the results (see the upper panel in Appendix Table A.4). This is because the strict identity checks at the train station and on the train are likely to intercept victims of trafficking. Second, it is also necessary to check whether the effect remains significant when we replace highway connectivity with the intensity of all types of roads at the city level. This variable counts the total length of roads that consists of expressways, trunk roads, and rural roads, and is from the Statistical Yearbooks of each city between 2000 and 2020. The major body of China's road network is still trunk roads, whose quality, speed, and tolls significantly contrast to those of the newly constructed highways. As suggested by the results in the lower panel of Table A.4, the effect, though remaining positive, becomes insignificant, particularly when the province-fixed effects are included. This suggests that the significant effect found in the baseline results is mainly

Table 3: Baseline results: City-pair+DID specification

	# incidents of child abduction in year t					
	neighboring cities			cities with similar past child trafficking		
	(1)	(2)	(3)	(4)	(5)	(6)
Connect	0.491***	0.441***	0.397***	1.368***	0.945***	0.825***
	(0.102)	(0.078)	(0.107)	(0.214)	(0.145)	(0.183)
	[0.197]	[0.156]	[0.144]	[0.648]	[0.367]	[0.294]
City FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓		✓	✓	
Year FE	✓			✓		
Province × year FE		✓			✓	
Pair × year FE			✓			✓
# Obs.	10240	10200	9400	5310	5310	4940
# Clusters: province-pair	554	550	470	284	284	247
# Clusters: city	276	272	267	255	255	247

[1] The standard errors clustered at the province-pair are reported in parentheses. The standard errors in the bracket listed are clustered at the city level. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] We apply the DID estimators to within-province city pairs obtained by two ways. The first method requires city pairs to be geographically contiguous, and the second requires a similar level of past accumulative child trafficking between 1960 and 1990 within the pair.

driven by the connectivity to highway networks rather than the increase in the trunk or rural roads.

Third, one may worry that our data on abduction reflects the availability of the internet, not of highways. Once the internet became available, people started posting and recording these incidents. As mentioned above, people can post records on the website even when the cases happened in previous years. To further alleviate the concern, we follow (Chen & Song, 2020) to generate an interaction term by using the city-level coverage of fixed-line telecommunications (broadband Internet/telephone) in 1999 obtained from China's City Statistical Yearbook to proxy the accessibility of the internet and exploiting the fact that China's internet upgrading began in 2000. Namely, people in cities that previously had higher coverage of broadband internet were more intensively affected and benefited from the internet upgrading project and thus more likely to rely on the internet to report missing cases. The results in Appendix Table A.5 show that the effect of highways is not eroded when we include the proxy of internet coverage; all the coefficients remain at the same level when compared to those in Table 3.

4.1.2 Further addressing endogeneity – IV approach

We first use the 1962 road network (Appendix Figure A.5) as a quasi-experiment to address the endogeneity. The 1962 roads were primarily built to transport agricultural products from local markets in rural areas to nearby urban centers in response to the policy of agricultural priority (Lyons, 1985, p.312). Such roads were rarely suitable for motorized traffic and were more suitable for horses and ox carts (Lippit, 1966, p.115). Despite low functionality, the 1962 road network established rights-of-way that facilitated the construction of low-cost highways on or along old roadways today, thus serving as a valid instrument.

We also construct a geographic slope for each city, derived from the ArcGIS software, calculating the average slope within each city (Lin, 2017). The motivation for choosing city ruggedness as an alternative IV is that expressway implementation depends on the construction difficulty, which hinges on the slope in each city. If the average slope of a city is large, this greatly reduces the possibility that that city is connected by the expressway. Therefore, we assume a close relationship between our two instruments and the expressways built since the 1990s.

As these instrumental variables are time-invariant, we use them in our cross-sectional regressions, referencing Dong et al. (2020). We use the accumulative incidents of child trafficking between 1999 and 2014 as a cross-sectional outcome, and the number of years of a city's connection to the highways built under the NTHS as an explanatory variable.[8] We then instrument the timing of current highway placement with a dummy indicating whether each city was connected by the historical road network and the slope for each city.

The validity of our instrument is based on the fact that the chosen variables determined the propensity of a city to be connected by expressways but were otherwise uncorrelated with child abduction. This exclusion restriction may be violated if the placement of historical roads was determined by earlier urban characteristics related to current child trafficking in those cities. For instance, large or better-located cities connected by road in 1962 also attracted low-qualified immigrants in the 1980s and 90s, leading to a higher likelihood of child trafficking. To alleviate this concern, we include an additional set of covariates that could be associated with these instruments while also affecting child trafficking. These include provincial fixed effects, city-pair fixed effects, wage per capita, night-time luminosity, governmental spending, infrastructure investment, and the share of employees across three sectors. The values of these variables in 1998 and past incidents of child abduction at the city level prior to 1990 were included in the analysis. The coefficients obtained from the OLS estimation in the cross-sectional regression and the IV approach are presented in Table 4, revealing that the sign and the magnitude of the estimated effects (columns 1–6) are consistent with the baseline results and our expectations.

As a placebo test, we examined the periods from 1965 to 1975 and from 1975 to 1985 and did not find an impact for connection of city on child abduction similar comparable to the significant impact found to exist for the period from 1999 to 2014. The results are reported in

[8]Using the change of *MA* measures between 1998 and 2013 does not alter the results.

Appendix Table A.6.

Table 4: Instrumental variable approach

	# incidents of child abduction between 1999 and 2014					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Connect	0.080***	0.186***	0.079***	0.267***	0.428***	0.094*
	(0.017)	(0.018)	(0.023)	(0.071)	(0.075)	(0.053)
Province FE	✓	✓	✓	✓	✓	✓
Pair FE		✓	✓		✓	✓
Controls			✓			✓
Instrument: Connect 1962				✓	✓	✓
Instrument: Ruggedness				✓	✓	✓
N	312	568	362	284	522	362
First-stage results						
Connect 1962				2.534***	1.455**	2.397**
				(0.687)	(0.721)	(0.927)
Ruggedness				-0.002***	-0.003***	-0.005***
				(0.000)	(0.000)	(0.001)
Cragg-Donald Wald F statistic				15.367	20.754	20.454
Sargan statistic P-val				0.125	0.675	0.556

[1] The standard errors clustered at the province-pair level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] City-level controls include the wage per capita in 1998, night-time luminosity in 1998, governmental spending in 1998, infrastructure investment in 1998, the share of employees across three sectors in 1998, and the past incidents of child abduction before 1990.

4.1.3 Managing concerns regarding staggered DID strategy

Recent papers (e.g., Callaway & Sant'Anna, 2021; Goodman-Bacon, 2021; Sun & Abraham, 2021) argue that time-varying (staggered) DID methods sometimes do not provide valid estimates even if the treatment status is being exogenously determined. In our case, the estimates of a two-way fixed effects DID model are variance-weighted average treatment effects on the treated sample using several 2×2 DID methods, each involving a comparison between a treated and control group before and after the treated group receives the treatment. We use the Goodman-Bacon (2021) DID decomposition to illustrate the source of variation and examine potential heterogeneity in the treatment effect on targeted cities.

When already-treated groups are used as comparison units, time-varying changes in their treatment effects are subtracted from the changes of later-treated units. While this does caution against summarizing time-varying effects with a single coefficient, it does not indicate a design failure. If the treatment effect for treated cities stabilized by 1998, it does not cause bias. First, our inclusion of province-year fixed effects in all specifications helps relieve this concern. Second, to avoid econometric concerns about the existence of already-treated cities, we extended the data by consulting the List of Expressways in China about the connectivity to highways of each city before 1998 (for the years 1995–1997) as supplements. In 1995, only a small set of cities were connected to the railway, and all the results remain robust when we exclude these cities in the already-treated groups, as suggested by Appendix Table A.7.[9] Then we use this extended panel data to explore the Bacon decomposition.

Appendix Figure A.6 plots each 2 × 2 DID against its weight and the average effect for the three groups of 2 × 2 comparisons: early/late, late/early, and treated/untreated. Around 37% of the variation is found to be from different treatment timing, and the rest from comparisons to cities whose connection dummy is unchanged during the sample period. When already-treated and never-treated units serve as controls, the effects are both highly positive (1.325 and 0.573), in addition to the comparison of earlier- to later-connected cities (0.181). Moreover, the comparison of later- to earlier-connected cities—the group that may bias our estimate, is negative (-0.065), on average. Thus, using the decomposition theorem to subtract the late-to-early components that lead to potential bias from the weighted average may be appropriate and lead to an even larger positive coefficient. We further confirm that our results are not biased from late-to-early treatment groups.

To further address problems that may arise in staggered DID, we reference de Chaisemartin & D'Haultfœuille (2020), generating an event-study figure using estimators robust to

[9] We do not use the data before 1998 in the benchmark analysis because we do not have the geo-referenced maps of expressways for years before that. However, using the extended panel data does not alter all the conclusions of this paper.

heterogeneous treatment effects across units or over time. This staggered event-study design allows us to verify the parallel trends assumption of whether the intensity of child trafficking in connected cities was already affected prior to the actual highway connection while considering heterogeneity in the treatment effect, including the leads and lags of the indicator of whether a city was connected. The results are presented in Appendix Figure A.7, where we plot the estimated coefficients for the leads of the connection dummy with respect to the actual connection timeline, verifying that before cities were connected to the expressway system, coefficients for child trafficking on the leads of the treatment dummy were close to zero. This supports the parallel trends assumption: the timing of connection to the expressway network is not correlated with previous trends in child trafficking. The event-study coefficient is slightly larger than the baseline regression (in Table 2), and close to the average weighted effects obtained when excluding the later- to earlier-treated terms.

4.2 Robustness checks

4.2.1 Sensitivity tests

Including time-variant, city-level covariates, such as economic development measured by city population density and night-time luminosity, government expenditure, other infrastructure investments, and share of employees across three sectors,[10] on the right-hand side of the regressions may lead to a problem of "bad controls," as some characteristics are endogenous. However, it is necessary to assess whether the conclusion holds when including this variable; otherwise, these factors may confound the results. For instance, a change in child trafficking may result from public spending. If the correlation between unobservable aspects that determine child abduction and public expenditure and that between highway connections and public expenditure are both positive, the main coefficient may be upwardly biased. The same logic applies to other infrastructure measures.

To exclude the confounding treatment effects, we re-run the specifications used in Tables 2 and 3 including time-variant, city-level characteristics, presenting the results in Appendix

[10] The statistics and data source of these variables are presented in Table 1.

Table A.8. The estimated coefficients remain highly significant and robust regardless of the explanatory measure used and after the inclusion of several confounding effects, with the coefficients of *MA* (which already took population into account) slightly smaller than the baseline results.

4.2.2 Underreporting and misreporting problems

Driven by the reporting feature of BCBH and the illegal nature of trafficking, the regional information regarding child abduction potentially suffers from an underreporting problem. On the one hand, this problem is less severe for child abduction than for child abandonment, where underreporting may result from parents' unwillingness to search for their abandoned child. On the other hand, for child abduction, the probability of underreporting could also be correlated with some variables related to the development of the cities (although the city fixed effects are included). We first consider the left-censoring feature of child abduction measurements, in which zero values could indicate no children missing or underreporting of child abduction (Bao et al., 2019). Accounting for this left-censoring structure, we confirm the consistency of the results using a Tobit specification, as shown in columns (1) and (2) in Appendix Table A.9.

We also consider the problem of underreporting by conducting a subsample analysis. Underreporting is a result of information obstacles, which are a function of household income, in searching for their children through the website. For instance, wealthier families from a developed city may be more likely to report the disappearance of their children. We address this potential problem by dropping the sample of capital cities or first-tier cities, as these cities were much more affluent than others, and their citizens have superior abilities to access various platforms.[11] The results after these exclusions are shown in columns (3) and (4) of Table A.9. We also split samples into areas with lower wages per capita and areas with higher average income.[12] The results on these subsamples (columns 5–6 of Table A.9) ensure that

[11]The list of first-tier cities is obtained from YiMagazine, which classified the city tier based on a comprehensive evaluation of five indicators: concentration of business resources, urban hubs, urban people activeness, lifestyle diversity, and future plasticity. There are in total five tiers.

[12]We use the median wage one year before the start of the panel dataset as the cutoff value of high and low

underreporting as a result of financial restrictions is not a problem.

Another concern relates to the misreporting of abandoned children as abductions due to moral pressure on parents who abandoned their children for money or other reasons and later regretted their decision and attempted to get them back, which could lead to a larger sample of child abductions. Due to a strong “son preference” in China, people were much less likely to abandon male babies than females; therefore, using a subsample that counts only missing boys would largely leave us exempted from misreporting problem (see column 1 of Table 5). Our results pass the series of robustness checks mentioned above, remaining consistent and robust. Besides, it is a classic econometric conclusion that measurement errors in the dependent variable would make the coefficients downward biased. Therefore, despite all these concerns, the true magnitude of our estimated coefficient should be even larger if family-reported cases could be more accurate.

4.3 Heterogeneity in the effects

4.3.1 Characteristics of abducted children

Panel A of Table 5 scrutinizes the heterogeneous effects of road connection among abducted children that differ in gender and age groups. Columns (1) and (2) of panel A distinguish abducted children according to gender, indicating that highway connect positively affects incidents of child abduction for both boys and girls, and strong male preference leads to more abductions in boys than girls. Columns (3) to (6) imply that children aged 10–16 are less likely to be abducted in response to transport infrastructure improvement. Considering that younger children have less memory and self-consciousness, and it is easier to cultivate the relationship between parents and children, the demand for younger kids was higher. Therefore, the traffickers tended to capture and transfer more young-aged kids when the availability of the trafficking process increased because of enhanced transportation networks.

wages per capita.

Table 5: Heterogeneity in the effects

Panel A: By characteristics of the abducted child

	# incidents of child abduction in year t					
	by gender		by age group			
	(1)	(2)	(3)	(4)	(5)	(6)
	boys	girls	0–1	1–4	4–10	10–16
Connect	0.299***	0.123**	0.107***	0.204**	0.105**	0.007
	(0.100)	(0.058)	(0.028)	(0.087)	(0.050)	(0.047)
City FE	✓	✓	✓	✓	✓	✓
Province × year FE	✓	✓	✓	✓	✓	✓
# Obs.	2730	2730	2730	2730	2730	2730
# Clusters	273	273	273	273	273	273

Panel B: By characteristics at the city level

	# incidents of child abduction in year t				# inflow of abducted children in year t	
	(1)	(2)	(3)	(4)	(5)	(6)
	large-large	large-small	small-small	arrest rate	high sex ratio	low sex ratio
Connect	0.485**	0.384**	0.310	0.712***	0.221***	0.049
	(0.238)	(0.182)	(0.230)	(0.180)	(0.082)	(0.040)
Connect*high arrest rate				-0.377**		
				(0.176)		
City FE	✓	✓	✓	✓	✓	✓
Province × year FE				✓	✓	✓
Pair × year FE	✓	✓	✓			
# Obs.	3740	3880	1780	2750	1540	1210
# Clusters	143	203	95	275	154	121

[1] The standard errors clustered at the city level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] In columns (1)–(3) in panel B, we re-match the city pair into either of these three types of pair: mega–mega, mega–second, and second–second pairs. Columns (4)–(6) include only the sample between 1999 and 2014, and do not apply the city-pair matching strategy (because as long as one city in the pair meets the exclusion criteria, we have to drop the whole pair of cities). We use the median value in 1998 as the cutoff to define cities with high and low sex ratios and with high and low arrest rates.

4.3.2 City-level characteristics

We then investigate heterogeneity based on the city-level characteristics in the lower panel of Table 5. We divide each city pair into large–large, large–small, and small–small pairs (Dong et al., 2020); for instance, a large–large pair includes two large cities. Large and small cities are distinguished based on their formal economic condition, whereas large cities are defined as those with a GDP above the median in 1990. This includes most of the cities in the first, second, and third tiers (out of the five tiers) in China. The results in columns (1)–(3) of panel B demonstrate that with highway connections, cities with a higher GDP have a higher incidence of child abduction than those of cities with a lower GDP. Combined with the results in columns (3) and (4) of Table A.9, we conclude that the trafficking vulnerabilities are larger for second and third-tier cities.

Column (4) presents evidence among provinces with different policing efforts, which are measured by annual arrest rates (i.e., higher arrest rates, higher policing efforts). The coefficients demonstrate a significantly larger impact of highway connections on child abductions in regions with fewer arrests. Columns (5) and (6) compare the effects in cities with high and low sex ratios, defined by the ratio of boy births to girl births with respect to the median value one year before the start of the panel dataset. It is reasonable to infer that cities with higher boy–girl ratios among newborns tend to have a stronger preference for boys (Edlund et al., 2013). Thus, the effects are only notably positive on the inflow cities with high sex ratios, representing regions with a higher demand to purchase children.

5 Mechanisms

There is a link between expressway infrastructure and child trafficking in China; the expanded markets' high revenues and cheaper transportation tempt people to engage in this illegal activity. Expressways give child traffickers quick and effective methods to transfer children within or even across provinces, making it more challenging for law authorities to find them. Transporting children is lucrative because it costs little money upfront but yields significant profits, which may encourage criminal activity.

Moreover, the construction of expressways has led to distributional effects and industrial transfer alongside the routes (Ma & Tang, 2021), which has raised the need for inexpensive labor from migrant workers, particularly those from rural areas. The rural-urban migration flows are further enhanced after the transportation construction. In rural areas, grandparents or other family members may look after kids when parents leave them behind to go to work somewhere else. The youngsters may, however, be more vulnerable to trafficking if the guardians cannot give the children proper care and supervision. In urban areas, more low-skilled labor flooded in, alleviating the risks to public safety and increasing the occurrence rate of trafficking.

5.1 Increased demand from extended markets

The increase in child trafficking during the period of expressway expansion might be explained by the fact that more demand arose from extended markets. Typically, within-country movements of traffickers transporting victims to waiting clients vary from short distances within a single city, medium distances between cities within the same province, to longer distance movement to other provinces (Brandt et al., 2011). Traffickers usually collect victims from train and bus stations and use transportation systems to transport children to different locations to be illegally adopted (Anthony, 2018). As noted in the introduction, security and identity checks are strict at train stations and airports in China; thus, the cross-regional transfer would more likely be accomplished via bus or private car. Highway connections should facilitate mid-length and long-distance trafficking movement, particularly across provinces, and thus the demand for children could also arise from far-away markets instead of just local markets.

Besides providing the possibility for expedient intercity travel, a well-built expressway may also reduce the cost of a crime by making it more difficult to retrieve an abducted child and less likely to arrest the traffickers. Child traffickers tend to seek households in places that are far away in the province or even in other more distant places outside the children's hometown province, to ensure a smaller likelihood of being recognized by their parents or caught by the police. Similarly, clients prefer to adopt illegal children from far-away provinces in the hope of getting away from their biological parents to better cultivate their future relationships.

To verify the hypothesis that the trafficking cases are inclined to happen across different provinces (thus, a longer distance) in response to enhanced transportation networks, we make use of two sets of data. First, The BCBH website reports successful cases of lost children who find their families. In these cases, the lost children's birthplace and in-flow place are well documented on the website. Second, a small subset of child-reported children looking for their families after they grow up also report information on their hometown and current residence, though the number is rather small. Combining these two datasets allows us to examine the cross-province movement of abducted children. The results in columns (1) and (2) of Table 6 indicate that the connection to the highway made it less likely to locate and retrieve the abducted children. Pairing the hometown and destination places obtained from the success-matching cases and the small subset of self-reported child abduction to identify the ratio of cross-province movement, we find the expressways increase the ratio of long-distance travel, as presented in columns (3) and (4), Table 6. Replacing the ratio with the average distance in kilometers between hometowns and destination places does not alter the conclusion (columns 5 and 6).

5.2 Enhanced rural-urban migration

We then document that the supply side of the trafficking market could also expand because more children are exposed to a higher risk of being trafficked. This is because transportation could lead to improved market access, thus leading to improved economic growth and higher gains in real wages in medium-sized cities. Moreover, the increased job opportunities in these cities are likely to consist of positions in labor-intensive industries after connecting with other large (first-tier) cities, which are likely to transfer the labor-intensive industries to medium-sized cities (Ma & Tang, 2021; Qin, 2016).We define cities in the second to the fourth tier as medium-sized cities.

Table 6: Demand from extended markets

	# success cases		cross-province transfer		dist. to the destination	
	(1)	(2)	(3)	(4)	(5)	(6)
Connect	-0.207**	-0.289***	0.137**	0.137**	1.154***	1.154***
	(0.098)	(0.078)	(0.058)	(0.057)	(0.365)	(0.361)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓		✓		✓	
Pair × year FE		✓		✓		✓
# Obs.	2580	7900	534	349	534	349
# Clusters	258	395	266	96	266	96

[1] The standard errors clustered at the city level are reported in parentheses in odd columns and at the province-pair level in even columns. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.
[2] We pair the hometown and destination places obtained from the success-matching cases and the small subset of self-reported abduction.

The supporting evidence is reported in Table 7. We first test whether connecting to new expressways led to higher gains in real wages in certain cities, with data coming from China's City Statistical Yearbook. As shown in columns (1) and (2), wage per capita increased for second to fourth-tier cities; but that for other cities (the first and fifth-tier cities) did not. Later, we explore the motivating effects of improved market access on job positions in labor-intensive industries.

To do so, we apply the newly registered enterprise and the Annual Survey of Industrial Firms (ASIF) datasets from 1999 to 2014. The newly registered enterprise data is originally from *Tianyancha*, a large database of Chinese enterprises that gathers information from official public records (Beraja et al., forthcoming).[13] We count the newly registered enterprises in the labor-intensive industries at the city-year level. We also use micro-level firm information from the ASIF dataset, conducted by the National Bureau of Statistics. The ASIF is the largest Chinese micro-enterprise database currently available, used in a growing body of literature (Brandt et al., 2011; Cai & Liu, 2016; Chaurey, 2017; Martin et al., 2011). This dataset includes rich information on the temporal dynamics for all the state-owned enterprises and

[13]The National Enterprise Credit Information Publicity System, managed by China's State Administration for Industry and Commerce, is a key source of information on businesses that *Tianyancha* compiles.

those non-state-owned companies whose annual value of sales was above five million Renminbi. We follow Lu (2019) to construct a dummy indicator using the labor–capital ratio to proxy each firm's labor intensity. Firms are considered to belong to labor-intensive sectors if the labor–capital ratio is above the median. We restrict the enterprises to those in the labor-intensive sectors.

Results are presented in columns (3)–(6) of Table 7. In columns (3) and (4), we use the first source of data to count the total number of newly established labor-intensive firms in each city-year unit between 1999 and 2014, obtaining a positive estimate for the variable expressway connection. This indicates increased firm entry into labor-intensive industries when the cities were connected by expressways; this effect is much larger for the second to fourth-tier cities. Column (5) reports estimates indicating the effect of expressway connections on the number of workers, finding a similar pattern indicating that employment in labor-intensive industries increased in the second to fourth-tier cities with expressway connections. While for other cities, we do not draw the same conclusion (column 6 of Table 7).

To sum up, the increased wages and job positions in medium-sized cities occur, raising the need for inexpensive migrant workers, particularly those from rural areas. In the later sections, we explore how migration increased the risk of child trafficking in rural and urban areas, respectively.

Rural areas: Loophole in parents' care. In response to increased employment opportunities and wages, the opportunity cost for the rural parents taking care of their children independently increases following transport infrastructure improvement. As parents no longer have enough time to accompany their children, grandparents or other relatives perform these tasks. Children may be more susceptible to being stolen or trafficked in such cases because the guardians, with even poorer education (as most of the grandparents are illiterate in the rural areas), may be less aware of the dangers of trafficking and less capable of protecting the children from abduction. In the worst cases, some kids must take care of themselves, performing tasks such as walking to school or walking home alone. Deprived of parental care, these chil-

Table 7: Wage and positions in labor-intensive industries

	log wage per capita		# new firms in labor-intensive ind.		log employment in labor-intensive ind.	
	2-4 tier	other	2-4 tier	other	2-4 tier	other
	(1)	(2)	(3)	(4)	(5)	(6)
Connect	0.017***	0.005	0.098***	0.016	0.054**	-0.058
	(0.006)	(0.010)	(0.029)	(0.051)	(0.025)	(0.043)
City FE	✓	✓	✓	✓		
Firm FE					✓	✓
Pair, year FE	✓	✓	✓	✓	✓	✓
# Obs.	6757	3209	6300	3447	1234325	611576
# Clusters	464	279	647	307	467	317

[1] The standard errors clustered at the province-pair are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] Columns (1)–(4) are at the city level; the data are from China City Yearbooks and the newly registered enterprise dataset in the years from 1999 to 2014. Columns (5) and (6) are at the firm level; the data are from the ASIF.

dren are at increased risk of being trafficked for sexual, labor, or criminal exploitation (EU, 2015, 2019; EUCPN, 2020).

To further verify this channel, we conduct an analysis at the child level using three survey waves (2010, 2012, and 2014) from the China Family Panel Studies (CFPS), which provides a nationally representative sample of Chinese families and individuals. The CFPS was launched by the Institute of Social Science Survey of Peking University, has five waves (2010, 2012, 2014, 2016, and 2018), and is still ongoing. Its sample covers 25 provinces, representing 95% of the total population of China (Xie, 2012). We use five variables from the CFPS to capture the increased opportunity cost for child cares and the decreased actual time the parents spent with their children. The first and the second variables imply whether the parents of a child out-migrated for better job opportunities in the past year and the amount of money sent home. Another set of outcomes includes three variables that indicate whether the child stayed with parents for at least a month and whether the child was accompanied and taken care of by parents in the previous year.

We restrict the sample to rural households and run a specification with the individual (children) fixed effects. The results of these analyses are reported in columns (1)–(5) of Table 8. We show that expressway connections increase the likelihood of out-migration for a job and the amount of money sent home if they out-migrated for work (columns 1 and 2). The increased income from working, equivalent to a decreased opportunity of accompanying children, would lead to a decreased probability of children living with their parents, being accompanied by and taken care of by parents other than other relatives, or staying alone (columns 3–5). Running the regressions to the urban household sample as a placebo test does not show us the same pattern, as reported in Appendix Table A.10, suggesting that the immigrants mainly consist of rural parents.

Urban areas: low-skilled laborers. Over the period of the expressway expansion, firms in the second to fourth cities in labor-intensive industries expand their number and size (Baum-Snow et al., 2017; Ghani et al., 2016), providing more jobs for low-skilled workers and thus leading to an increased inflow of rural-urban immigrants (Dong, 2018). The large inflow of immigrants is likely to generate poor labor market outcomes, causing an increased likelihood of violent delinquency (Bianchi et al., 2012; Spenkuch, 2014).

The increase in labor-intensive industries would attract more low-skill immigrants to the city. To test this channel, we use county-level information collected by the Nation Population Census in the years 2000, 2005, 2010, and 2015, defining an immigrant as individuals who lived in a county that differed from their *hukou* county at the time of the survey.[14] We then construct the ratio of low-skilled immigrants over total immigrants as our dependent variable.[15] Results are presented in column (6) of Table 8, indicating a positive effect of expressways connection on low-skilled immigrants with pair-year fixed effects. Low-skilled immigrants increase the possibility of violent delinquency and crime, among which there is child traffick-

[14]The *hukou* system in China is an administrative system that governs Chinese citizens' migration that is settled based on citizens' birthplace.

[15]Note that the literature has considered different limits in defining low-skilled workers (e.g., at least a high school degree or at least a college degree). We define low-skilled immigrants as those who do not receive a college education, and our results remain robust using other cutoffs.

ing.

Table 8: Rural-urban migration

Variables	Rural areas					Urban areas
	out-migrate for work	amt. of money sent back	live with parents	accompanied for > 1 month	taken care by parents	% low-skilled immigrants
	(1)	(2)	(3)	(4)	(5)	(6)
Connect**	0.053***	0.855***	-0.064***	-0.037***	-0.092***	0.013***
	(0.011)	(0.134)	(0.007)	(0.005)	(0.011)	(0.002)
Individual FE	✓	✓	✓	✓	✓	
City FE						✓
Pair, year FE	✓	✓	✓	✓	✓	✓
# Obs.	27024	13827	41410	41477	42435	2785
# Clusters	313	300	313	313	313	466

1 The standard errors clustered at the province-pair are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

2 Columns (1)–(5) are at the individual level. Data in columns (1) and (2) comes from the CFPS 2010 and 2014 (the question in wave 2012 is different), and column (4) includes only those with parents migrating out for work. Controls include each individual's age and years of schooling. Column (6) is at the city level; the data are from the Nation Population Census in the years 2000, 2005, 2010, and 2015.

6 Conclusion

Applying various specification methods and robustness checks, we find that the connection of expressways significantly leads to an increased incidence of child trafficking, an intercity crime that causes serious social problems. To conclude, through the two abovementioned channels, the public infrastructure acts as a role for providing a breeding ground for intercity crime. We propose policy implications by encouraging public participation in key cities with a high risk of trafficking. First, antitrafficking knowledge for parents and children should be emphasized through community activities. Second, we should improve the public security notification system by combining it with video surveillance and facial recognition capabilities, which would enable police to capture the most up-to-date information regarding suspicious behaviors related to children.

When child trafficking occurs, enhanced routine identity and security checks at transportation hubs, particularly those of highway toll stations, would be extremely helpful. The personnel in charge of checking could expediently notice and intercept victims of trafficking. Launching criminal investigations at the critical nodes of the transportation network could maximize benefits by exposing and curtailing cross-regional networks of trafficking at the national level. Finally, it is necessary to remove existing information barriers and promote platforms, such as the BCBH website, in economically disadvantaged areas.

References

Almond, D., Li, H., and Zhang, S., 2019. Land reform and sex selection in China. J. Polit. Econ. 127(2): 560-585.

Anderson, S., Ray, D., 2010. Missing women: age and disease. Rev. Econ. Stud. 77: 1262-1300.

Anthony, B., 2018. On-ramps, intersections, and exit routes: A roadmap for systems and industries to prevent and disrupt human trafficking. Polaris Project.

Arunachalam, R., Shah, M., 2013. Compensated for life sex work and disease risk. J. Hum. Resour. 48 (2), 345-369.

Bai, Y., Liu, X., Li, Y., 2022. University campus and child trafficking. Working paper.

Bao, X., Galiani, S., Li, K., Long, C., 2019. Where have all the children gone? An empirical study of child abandonment and abduction in China. NBER working paper 26492.

Banerjee, A., Duflo, E., Qian, N., 2020. On the road: Access to transportation infrastructure and economic growth in China. J. Dev. Econ. 145: 102442.

Baum-Snow, N., Brandt, L., Henderson, J.V., Turner, M.A., Zhang, Q., 2017. Roads, railroads, and decentralization of Chinese cities. Rev. Econ. Stat. 99(3): 435-448.

Baum-Snow, N., Henderson, J.V., Turner, M.A., Zhang, Q., Brandt, L., 2020. Does investment in national highways help or hurt hinterland city growth? J. Urban Econ. 115: 103124.

Beraja, M., Yang, D.Y., Yuchtman, N., forthcoming. Data-intensive innovation and the state: Evidence from AI firms in China. Review of Economic Studies.

Bianchi, M., Buonanno, P., Pinotti, P., 2012. Do immigrants cause crime? J. Eur. Econ. Assoc. 10(6): 1318-1347.

Bosker, M., Deichmann, U., Roberts, M., 2018. Hukou and highways: The impact of China's spatial development policies on urbanization and regional inequality. Reg. Sci. Urban Econ. 71: 91-109.

Brandt, L., van Biesebroeck, J., Zhang, Y., 2011. Creative accounting or creative destruction? Firm-level productivity growth in Chinese manufacturing. J. Dev. Econ. 97: 339-351.

Brayley, H., Cockbain, E., 2014. British children can be trafficked too: Towards an inclusive definition of internal child sex trafficking. Child Abuse Rev. 23: 171-184.

Cai, H.B., Liu, Q., 2009. Competition and corporate tax avoidance: Evidence from Chinese industrial firm. Econ. J. 119: 764-795.

Cai, X., 2016. Penalties configuration and penalties distribution of crime of child trafficking. Soc. Sci. Beijing 7: 13-26.

Callaway, B., Sant'Anna, P.H., 2021. Difference-in-differences with multiple time periods. J. Econom. 225(2): 200-230.

Coomaraswamy, R., 2001. United Nations addendum report to the human rights commission regarding mission to Bangladesh, Nepal and India on the issue of trafficking of women and children.

Chaurey, R., 2017. Location-based tax incentives: Evidence from India. J. Pub. Econ. 156: 101-20.

Chen, Y., Ebenstein, A., Edlund, L., Li, H., 2015. Girl adoption in China-A less-known side of son preference. Popul. Stud (Camb). 69(2): 161-89.

de Chaisemartin, C., D'Haultfœuille, X., 2020. Two-way fixed effects estimators with heterogeneous treatment effects. Am. Econ. Rev. 110(9): 2964-96.

Dessy, S., Mbiekop, F., and Pallage, S., 2005. The economics of child trafficking (part ii). Cahier de recherche/Working Paper, 05-09.

Dessy, S., Pallage, S., 2006. Some surprising effects of better law enforcement against child trafficking. J. Afr. Dev. 8: 115-132.

Donaldson, D., Hornbeck, R., 2016. Railroads and american economic growth: a "market access" approach. Q. J. Econ. 131(2): 799-858.

Dong, X., 2018. High-speed railway and urban sectoral employment in China. Transp. Res. Part A Policy Pract. 116: 603-621.

Dong, X., Zheng, S., Kahn, M.E., 2020. The role of transportation speed in facilitating high skilled teamwork across cities. J. Urban Econ. 115: 103212.

Duranton, G., Turner, M.A., 2012. Urban growth and transportation. Rev. Econ. Stud. 79(4): 1407-1440.

Duranton, G., Morrow, P.M., Turner, M.A., 2014. Roads and trade: evidence from the US. Rev. Econ. Stud. 81(2): 681-724.

Ebenstein, A., 2010. The "missing girls" of China and the unintended consequences of the one child policy. J. Hum. Resour. 45(1): 87-115.

Edlund, L., Korn, E., 2002. A theory of prostitution. J. Polit. Econ. 110(1): 181-214.

Edlund, L., Li, H., Yi, J., Zhang, J., 2013. Sex ratio and crime: Evidence from China. Rev. Econ. Stat. 95(5): 1520-1534.

Edmonds, E.V., 2007. Child labor. Handb. Dev. Econ. 4, 3607-3709.

Edmonds, E.V., 2010. Selection into worst forms of child labor. Child Labor and the Transition between School and Work. Emerald Group Publishing Limited, England.

European Union: European Agency for Fundamental Rights, 2015. Guardianship systems for children deprived of parental care in the European Union - With a particular focus on their role in responding to child trafficking, available at: https://www.refworld.org/docid/566aef6e4.html

European Union: European Agency for Fundamental Rights, 2019. Children deprived of parental care found in an EU Member State other than their own.

European Crime Prevention Network, 2020. Unaccompanied minors at risk: preventing child trafficking. Brussels: EUCPN.

Faber, B., 2014. Trade integration, market size, and industrialization: Evidence from China's National Trunk Highway System. Rev. Econ. Stud. 81(3): 1046-1070.

Ghani, E., Goswami, A.G., Kerr, W.R., 2016. Highway to success: The impact of the golden quadrilateral project for the location and performance of Indian manufacturing. Econ. J. 126: 317-357.

Goodman-Bacon, A., 2021. Difference-in-differences with variation in treatment timing. J. Econom. 225(2): 254-277.

He, G., Xie, Y., Zhang, B., 2020. Expressways, GDP, and the environment: The case of China. J. Dev. Econ. 145: 102485.

Howden, D., Zhou, Y., 2014. China's one-child policy: some unintended consequences. Econ. Aff. 34(3): 353-369.

Jing, K., Liao, W., 2022. Expressways, market access, and industrial development in China. Working paper.

Kolk, A., van Tulder, R., 2002. Child labor and multinational conduct: A comparison of international business and stakeholder codes. J. Bus. Ethics 36: 291-301.

Li, H., Lang, K., Leong, K., 2018. Does competition eliminate discrimination? evidence from the commercial sex market in Singapore. Econ. J. 128(611): 1570-1608.

Lin, Y., 2017. Travel costs and urban specialization patterns: Evidence from China's high speed railway system. J. Urban Econ. 98: 98-123.

Lippit, V.D., 1966. Development of transportation in Communist China. China Quart. 27: 101-119.

Lu, Y., Wang, J., Zhu, L., 2019. Place-based policies, creation, and agglomeration economies: Evidence from China's Economic Zone Program. Am. Econ. J.: Econ. Policy 11(3): 325-360.

Lyons, 1985. Transportation in Chinese development, 1952-1982. J. Dev. Areas 19(2): 305-328.

Ma, L., Tang, Y., 2021. The distributional impacts of transportation networks in China. Working paper.

Mahmoud, T.O., Trebesch, C., 2010. The economics of human trafficking and labour migration: Micro-evidence from Eastern Europe. J. Comp. Econ. 38: 173-188.

Martin, P, Mayer, T., Mayneris, F., 2011. Spatial concentration and plant-level productivity in France. J. Urban Econ. 69: 182-195.

Qin, Y., 2016. 'No county left behind?' The distributional impact of high-speed rail upgrades in China. J. Econ. Geogr. 17(3): 489-520.

Roberts, M., Deichmann, U., Fingleton, B. Shi, T., 2012. Evaluating China's road to prosperity: A new economic geography approach. Reg. Sci. Urban Econ. 42(4): 580-594.

Chen, S., Liu, W., Song, H.,2020. Broadband internet, firm performance, and worker welfare: Evidence and mechanism. Economic Inquiry, 58(3), 1146-1166.

Shoji, M., Tsubota, K., 2022. Sexual exploitation of trafficked children: Survey evidence from child sex workers in Bangladesh. J. Comp. Econ. 50(1): 101-117.

Spenkuch, J.L., 2014. Understanding the impact of immigration on crime. Am. Law Econ. Rev. 16(1): 177-219.

Sun, L., Abraham, S., 2021. Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. J. Econom. 225(2): 175-199.

Tiefenbrun, S., 2007. Child soldiers, slavery and the trafficking of children. Fordham Int. Law J. 31(2): 415-486.

Xie, Y., 2012. The user's guide of the China Family Panel Studies (2010), Beijing: Institute of Social Science Survey.

Wang, Z., Wei, L., Peng, S., Deng, L., Niu, B., 2018. Child-trafficking networks of illegal adoption in China. Nat. Sustain. 1(5): 254-260.

Zheng, S., Kahn, M.E., 2013. China's bullet trains facilitate market integration and mitigate the cost of megacity growth. Proc. Natl. Acad. Sci. 110(14): E1248-E1253.

Appendix A: Figures

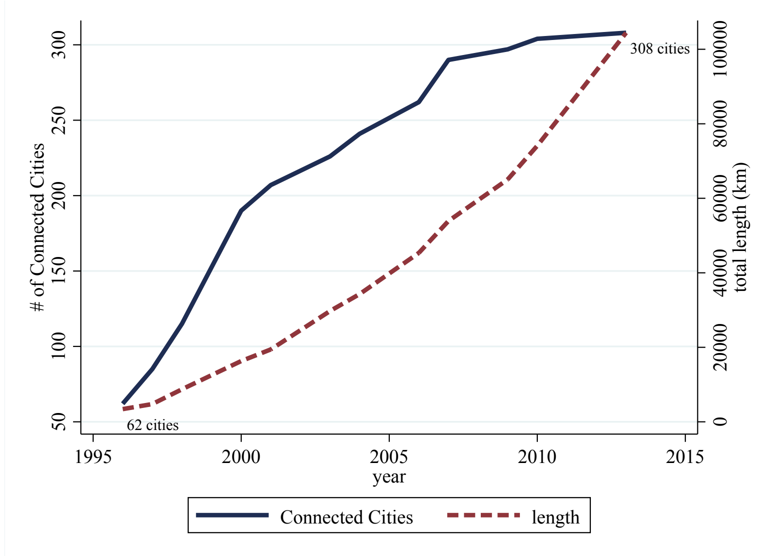


Figure A.1: Expressway Construction in China

Note: The figure shows the changes in the number of expressway-connected cities and total expressway length.

[634174][redacted]–登记信息

寻亲类别：	家寻宝贝	Type: Family-reported case
失踪类型：	被拐	Why Lost: Child Trafficking
寻亲编号：	634174	Child ID: 634174
姓名：	[redacted]	Child's Name
性别：	男	Child Gender: Male
出生日期：	2018-03-09	Child Birth Date
失踪时身高：	110CM	Height of Child when Lost: 110cm
失踪时间：	2022-07-24	Time of Lost: 2022 July 24
失踪地点：	青海省,西宁市,大通回族土族自治县,大通县景阳镇寺沟村广场	Lost Location: Qing Hai

Figure A.2: Example of an abducted case reported in the BCBH website

Note: This figure presents an example of an abducted child that was reported by a family in the BCBH community.

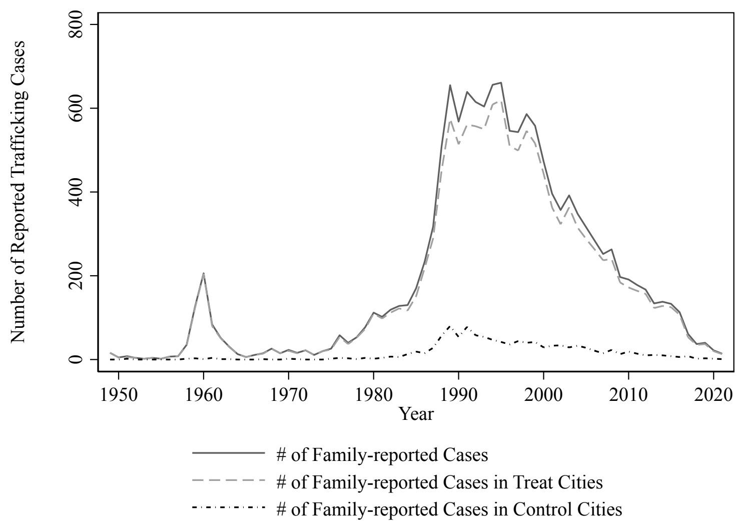


Figure A.3: Annual trend of reported abducted children

Source: BCBH. Note: The figure depicts an annual trend of family-reported abducted children between 1949 and 2021. The dramatic increase in cases in the 1980s may be the effect of the one-child policy and the land reform, and the trend continued to shift upward until around 1997, when the number of cases began to decrease, largely due to the change of rules in the Crime Law.

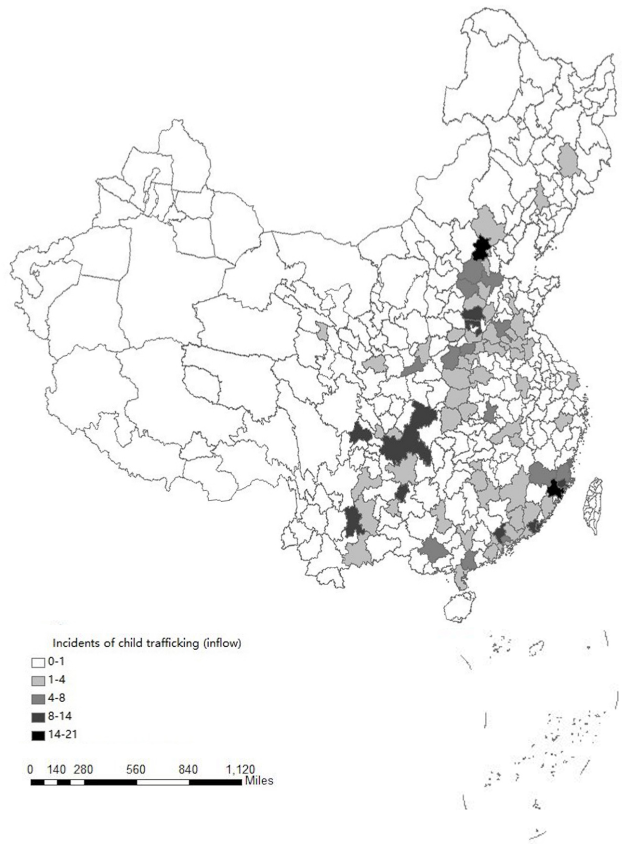


Figure A.4: Distribution of child-reported abduction in China (1999–2014): Inflow cities

Note: The figure displays the geographic distribution of inflow cities (cities to which the abducted children were transferred) of the abducted children, obtained from the self-reported records. The destination location is available in the BCBH only if the information is reported by the victims (children would report where they live now in self-reported records), and a small subset of success cases of families who find their lost children (although the number is rather small). The distribution of the outflow cities reported by their family are shown in Figure 2.

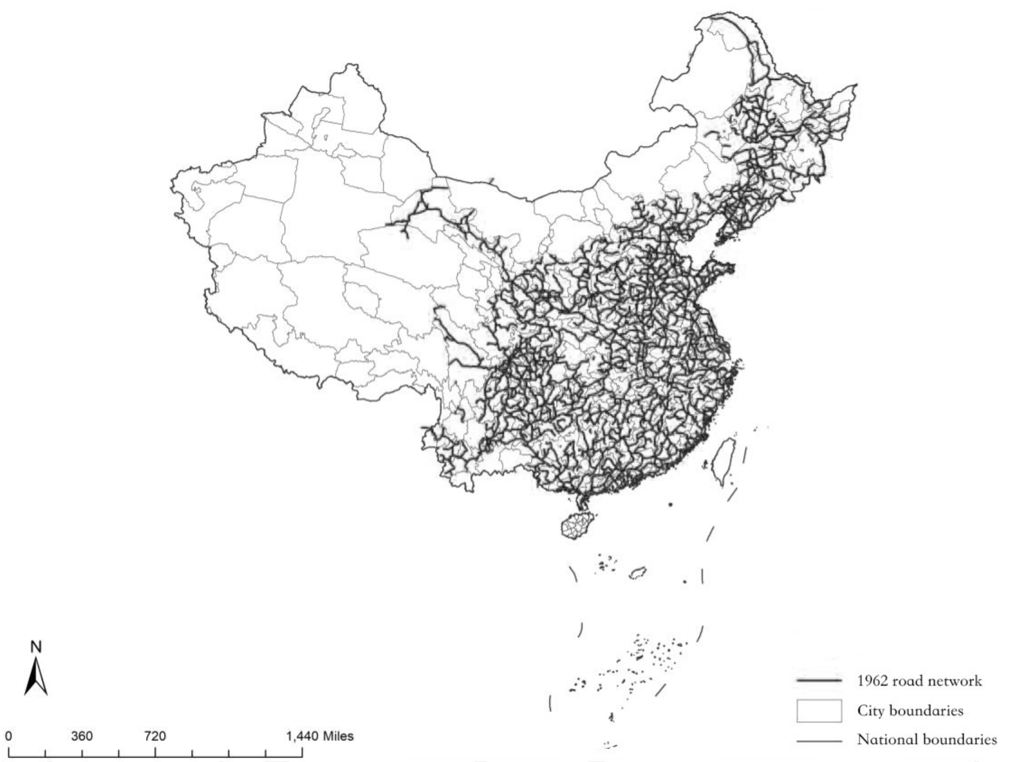
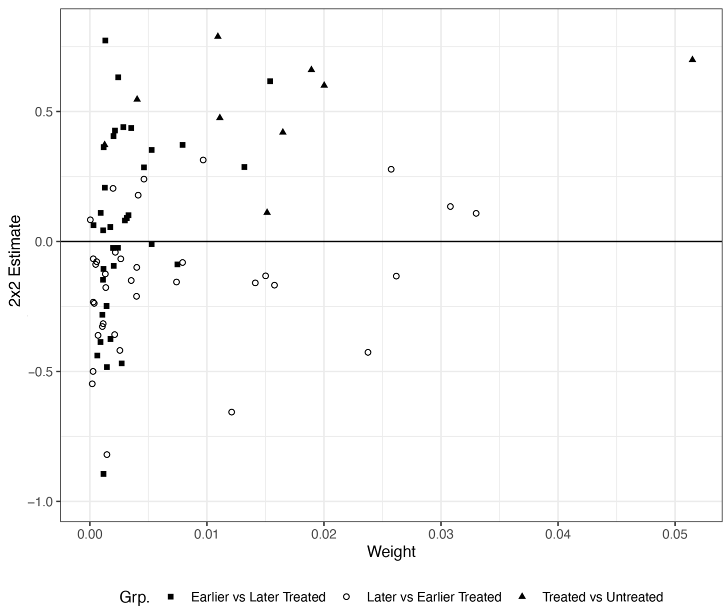


Figure A.5: The distribution of the 1962 road network

Note: The figure displays the historical road system in 1962. The data source is from Baum-Snow et al. (2017).



Group	Avg. est.	Weight
Earlier vs Later Treated	0.181	0.111
Later vs Always Treated	1.325	0.477
Later vs Earlier Treated	-0.065	0.263
Treated vs Untreated	0.573	0.149

Figure A.6: DID decomposition for expressway connection and child abduction

Note: The estimate of two-way fixed effects equals the average estimated values multiplying the variance weights, as indicated in the table. The figure displays the 2x2 DID components from Goodman-Bacon (2021)'s decomposition theorem against their weight. The open circles are later treatment vs. earlier control terms. The closed squares are earlier treatment vs. later control terms. The closed triangles are the treated vs. untreated terms.

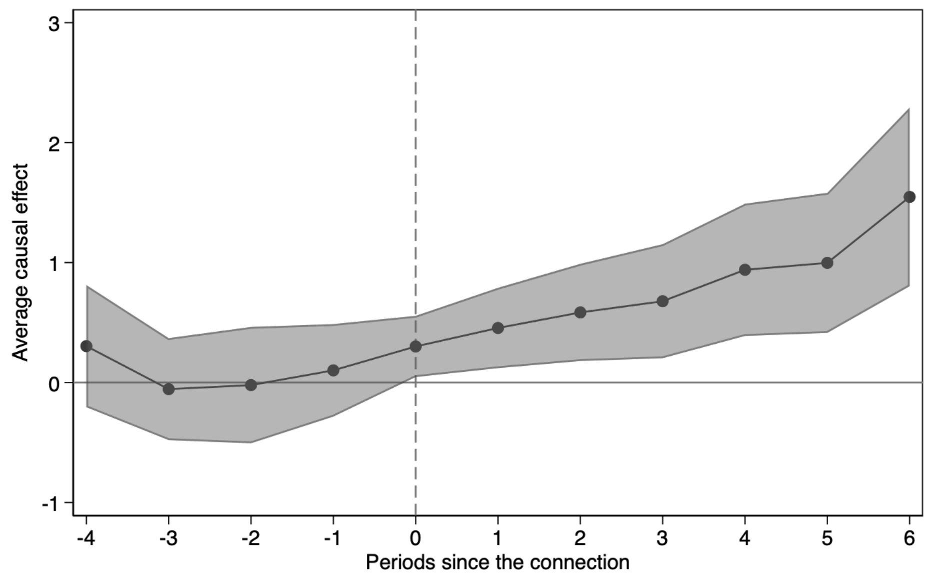


Figure A.7: Staggered event-study regression

Note: The figure plots the estimates and the 95% confidence intervals of the coefficients obtained using a staggered event-study regression (de Chaisemartin & D'Haultfœuille, 2020), where the y-axis denotes the average causal effect and the horizontal axis denotes years before or after the connection to the expressway network.

Appendix A: Tables

Table A.1: Balancing tests: difference within pair in 1998

	Luminosity	Population	Expenditure	Investment	Industry Employment	Students
	(1)	(2)	(3)	(4)	(5)	(6)
Difference within pair	0.025	-0.016	0.286	0.453***	0.015	0.034
	(0.049)	(0.041)	(0.190)	(0.125)	(0.020)	(0.104)
# Obs.	476	501	501	501	466	380

[1] Robust standard errors clustered at the province level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] Cross-sectional information in the year 1998 are used to test whether the main socio-demographic characteristics were balanced within each pair.

Table A.2: Various forms of the outcome variable

	# incidents (non-zero cells)			# incidents / $\ln$ population		
	all cities	targeted cities		all cities	targeted cities	
	(1)	(2)	(3)	(4)	(5)	(6)
Connect	1.041***	1.187***	0.994***	0.088***	0.090***	0.084***
	(0.334)	(0.367)	(0.306)	(0.031)	(0.031)	(0.024)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓		✓	✓	
Province × year FE			✓			✓
# Obs.	1279	1171	1093	2709	2658	2601
# Clusters	244	220	206	287	279	273

[1] The standard errors clustered at the city level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table A.3: Results using inflow cities and child-reported cases

	# inflow of abducted children in year t					
	all cities	targeted cities				
	(1)	(2)	(3)	(4) overall	(5) within prov.	(6) to ports
Connect	0.087***	0.126***	0.126**			
	(0.033)	(0.047)	(0.050)			
$\ln$ Market access				0.005**	0.005**	0.005**
				(0.002)	(0.002)	(0.003)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓		✓	✓	
Province $\times$ year FE			✓			✓
# Obs.	3690	2790	2730	2730	2730	2730
# Clusters	369	279	273	273	273	273

[1] The standard errors clustered at the city level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table A.4: Additional test: High-speed rail and length of all roads

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: High-speed rail	# incidents of child abduction in year t					
	neighboring cities			cities with similar past child trafficking		
High-speed rail	0.046	-0.014	-0.010	0.103	0.086	0.084
	(0.037)	(0.039)	(0.055)	(0.071)	(0.073)	(0.094)
City FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓		✓	✓	
Year FE	✓			✓		
Province × year FE		✓			✓	
Pair × year FE			✓			✓
# Obs.	11253	11220	10340	5830	5830	5412
# Clusters	553	550	470	284	284	246
Panel B: Length of all roads	# incidents of child abduction in year t					
	neighboring cities			cities with similar past child trafficking		
Increase in length (log)	0.207***	0.124**	0.110	0.624***	0.121	0.254
	(0.057)	(0.057)	(0.085)	(0.129)	(0.120)	(0.159)
City FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓		✓	✓	
Year FE	✓			✓		
Province × year FE		✓			✓	
Pair × year FE			✓			✓
# Obs.	21504	21420	19740	11151	11151	10374
# Clusters	554	550	470	284	284	247

[1] The standard errors clustered at the province-pair level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] We apply the DID estimators to within-province city pairs obtained by two ways. The first method requires city pairs to be geographically contiguous, and the second requires a similar level of past accumulative child trafficking between 1960 and 1990 within the pair.

Table A.5: Additional test: Internet access

	# incidents of child abduction in year t					
	neighboring cities			cities with similar past child trafficking		
Connect	0.478***	0.471***	0.389***	1.351***	0.856***	0.582***
	(0.111)	(0.091)	(0.120)	(0.228)	(0.152)	(0.165)
Internet Access	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓		✓	✓	
Year FE	✓			✓		
Province × year FE		✓			✓	
Pair × year FE			✓			✓
# Obs.	8360	8330	6640	4870	4870	4060
# Clusters	504	501	332	284	284	203

[1] The standard errors clustered at the province-pair level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] We apply the DID estimators to within-province city pairs obtained by two ways. The first method requires city pairs to be geographically contiguous, and the second requires a similar level of past accumulative child trafficking between 1960 and 1990 within the pair.

Table A.6: IV: placebo test

	# incidents of child abduction before	
	(1965-75)	(1975-85)
Connect	0.007	0.035
	(0.045)	(0.047)
Province FE	✓	✓
Pair FE	✓	✓
Controls	✓	✓
Instrument: Connect 1962	✓	✓
Instrument: Ruggedness	✓	✓
N	362	362

[1] The standard errors clustered at the city level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] City-level controls include the wage per capita in 1998, night-time luminosity in 1998, governmental spending in 1998, infrastructure investment in 1998, the share of employees across three sectors in 1998, and the past incidents of child abduction before 1990.

Table A.7: Excluding the cities in the already-treated groups

	# incidents of child abduction in year t					
	neighboring cities			cities with similar past child trafficking		
Connect	0.348***	0.306***	0.261***	1.026***	0.314***	0.286**
	(0.095)	(0.062)	(0.085)	(0.240)	(0.104)	(0.143)
City FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓		✓	✓	
Year FE	✓			✓		
Province × year FE		✓			✓	
Pair × year FE			✓			✓
# Obs.	9972	9960	7680	4536	4536	3000
# Clusters	511	510	320	253	253	125

[1] The standard errors clustered at the province-pair are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] We apply the DID estimators to within-province city pairs obtained by two ways. The first method requires city pairs to be geographically contiguous, and the second requires a similar level of past accumulative child trafficking between 1960 and 1990 within the pair.

Table A.8: Robustness checks: Sensitivity tests

	# incidents of child abduction in year t					
	DID		City-pair+DID			
	(1)	(2)	(3)	(4) overall	(5) within prov.	(6) to ports
Connect	0.490***	0.472***	0.672***			
	(0.174)	(0.136)	(0.168)			
ln Market access				0.016**	0.018**	0.017**
				(0.007)	(0.007)	(0.007)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓					
Province × year FE		✓				
Pair × year FE			✓	✓	✓	✓
Time-variant covariates	✓	✓	✓	✓	✓	✓
# Obs.	2454	2398	4212	4212	4212	4212
# Clusters	274	268	242	242	242	242

[1] In columns (1) and (2) the standard errors are clustered at the city level, while in columns (3)–(6) the standard errors are clustered at the province-pair level. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] Time-variant city-level covariates include city economic development measured by logged population density and logged average income, logged government spending, logged infrastructure investment, and the share of employees across three sectors. All variables are displayed in a lagged term covering the period between 1998 and 2013.

Table A.9: Robustness checks: Under-reporting and misreporting

	# incidents of child abduction in year t					
	Tobit specification		information barriers			
	(1)	(2)	(3) without capital	(4) without first tier	(5) developed	(6) non-developed
Connect	0.721***	0.505***	0.331***	0.266***	1.397***	0.373***
	(0.232)	(0.146)	(0.107)	(0.093)	(0.488)	(0.166)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓					
Province × year FE		✓	✓	✓	✓	✓
# Obs.	3069	3069	2351	2301	626	1931
# Clusters	279	279	242	237	72	193

[1] The standard errors clustered at the city level are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] City-pair matching strategy can not be applied to the exercises in this table, because as long as one city in the pair meets the exclusion criteria, we have to drop the whole pair of cities.

Table A.10: Placebo: urban household samples

	out-migrate for work (1)	live with parents (2)	accompanied for >1 month (3)	taken care by parents (4)
Connect	0.068	-0.006	-0.029	-0.032
	(0.065)	(0.006)	(0.019)	(0.044)
Individual FE	✓	✓	✓	✓
Pair, year FE	✓	✓	✓	✓
# Obs.	15352	23763	15154	15818
# Clusters	338	338	336	336

[1] The standard errors clustered at the province-pair are reported in parentheses. *Significant at 10%, ** Significant at 5%, *** Significant at 1%.

[2] This table focuses only on urban samples. Controls include each individual's age, gender, and years of schooling.

Appendix B: Estimation of the power-decay parameter in market access (MA) measurement

Our paper follows (Jing & Liao, 2022) to estimate the power-decay parameter θ, which determines how the market access decays with travel time along with the expressways. Besides *MA* measurement, the power-decay parameter is also known as trade elasticity developed from the gravity model of trade (Burger et al., 2009; Coşar & Demir, 2009). The empirical model for estimating the trade elasticity takes the following linear function form:

$$\ln Volume_{ipt} = \alpha - \theta \ln T_{ipt} + \gamma PortSize_{pt} + \delta_i + \eta_t + \mu_{ipt}$$

where *Volume* is the trade volume from city to port in the year for export purposes. *PortSize* represents the total export volume. Time fixed effects and city fixed effects are controlled. The estimated coefficient of travel time in minutes is the trade elasticity. The estimated value of the parameter is 1.1, with a 95 percent confidence interval between 1.07 and 1.16. It is well in line with the trade elasticity values documented in the literature on regional and domestic transportation.

References

Burger, M., van Oort, F., Linders, G.J., 2009. On the specification of the gravity model of trade: zeros, excess zeros and zero-inflated estimation. Spat. Econ. Anal. 4(2): 167-90.

Coşar, A.K., Demir, B., 2016. Domestic road infrastructure and international trade: Evidence from Turkey. J. Dev. Econ. 118: 232-244.

Jing, K., Liao, W., 2022. Expressways, market access, and industrial development in China. Working paper.