Human Organ Trafficking and Missing Persons in China

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Abstract

The persistent shortage of human organs for transplantation has long been a global challenge. The potential for substantial profit creates strong incentives for illegal organ trafficking, including murder for organ harvesting. Yet, empirical evidence on this issue remains limited. China provides an ideal context for studying this phenomenon. Since 1984, executed prisoners have been the primary source of transplant organs in China. In 2015, the Chinese government abolished the practice of using organs from executed prisoners, which significantly exacerbated the organ shortage. Following this policy change, a notable increase in the number of missing persons was observed across the country. Employing difference-in-differences and triple-difference strategies, our analysis reveals that, compared to missing persons unrelated to organ trafficking (e.g., voluntary disappearances), the number and incidence of involuntary missing persons potentially related to organ trafficking increased significantly after 2015. This effect is particularly pronounced among adult men, individuals with mental illness, and in regions with hospitals qualified to perform organ transplants.

Keywords: Human organ trafficking, missing persons, executed prisoners

JEL classification: K42, O17

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1. Introduction

Since the clinical introduction of cyclosporine for suppressing organ transplant rejection in 1983, organ transplantation has become an effective treatment for many life-threatening diseases (Colombo and Ammirati, 2011). However, the global shortage of transplantable organs quickly emerged as a significant challenge (Rothman et al., 1997; Colombo and Ammirati, 2011; Beard, Kaserman, and Osterkamp, 2013). Due to ethical concerns, most countries have implemented strict regulations on organ trade, mandating voluntary, uncompensated donation as the only legal source of transplantable organs (Ghods and Savaj, 2006; Ambagtsheer, 2021; Ashlagi and Roth, 2021). While these regulations are ethically grounded, they have further constrained the organ supply and exacerbated the shortage. In 2011, the number of organ transplants performed worldwide accounted for less than 10% of the global anticipated demand (Da Silva and Frontera, 2015). Even in the United States, which has a well-established organ donation and distribution system, the organ supply-demand ratio remained at 1:4 in 2015, with the average waiting time for a kidney transplant reaching 600 days (Bentley and Ortner, 2020). As a result, many patients experience deteriorating health or death due to the lack of timely access to a matching organ.

The organ market, characterized by highly inelastic demand and significant supply constraints, creates strong incentives for illegal organ trafficking due to the potential for substantial profits. In fact, organ trade ranks among the top 5 most profitable organized crimes globally, generating an estimated annual profit of $1.7 billion (Global Financial Integrity, 2017). Organ trafficking is a global phenomenon, occurring on every continent and involving both developed and developing countries (Ambagtsheer et al., 2016). The most extreme form of this illicit activity is murder for organ harvesting, a crime that poses severe threats to public safety and social stability.

Despite being recognized as a heinous crime globally, illegal organ trafficking has seen few cases identified or prosecuted, partly due to the law enforcement's limited knowledge and awareness of the issue (Ambagtsheer, 2021). The covert nature of these crimes has fueled widespread speculation and suspicion for years, yet direct empirical evidence remains scarce. This paper seeks to address this gap in the literature by providing a comprehensive empirical analysis of the phenomenon.

China's organ market provides an ideal context for empirically studying this issue. Traditional Chinese culture places significant emphasis on preserving the body's integrity after death, making organ donation widely viewed as conflicting with ethical and cultural beliefs (Rothman et al., 1997). As a result, the number of voluntary organ donations has remained extremely low, leading to a severe and persistent shortage of transplantable organs. According to statistics from the Ministry of Health in

2012, approximately one million patients undergoing dialysis required kidney transplants annually, while around 300,000 patients with end-stage liver disease needed liver transplants. Due to the organ shortage, fewer than 10,000 transplants were successfully performed each year, leaving the vast majority of patients to die while waiting. The supply-demand ratio for organ transplants was approximately 1:150, significantly higher than the global average of 1:10.[1]

For decades, China's transplantable organ supply relied heavily on executed prisoners. In 1984, the Chinese government issued a directive permitting the use of organs from executed prisoners as a legal source for transplants (Rothman, 1997). This practice quickly became the predominant source of transplantable organs in the country. Although the exact numbers of judicial executions and transplants have been kept as official state secrets (Robertson and Lavee, 2022), it is widely acknowledged that executed prisoners accounted for over 95% of the organ supply (Huang, 2007).

While this practice helped alleviate the organ shortage, it raised serious human rights concerns and drew widespread international condemnation (Danovitch, Shapiro, and Lavee, 2011; Delmonico et al., 2014). In response to mounting global pressure, the Chinese government announced in late 2014 that it would stop the use of prisoner organs for transplants from January 1, 2015. Although this policy was well-intentioned, scholars have expressed concerns that the resulting exacerbation of the organ shortage could spur the growth of a black market trade (The Lancet, 2015).

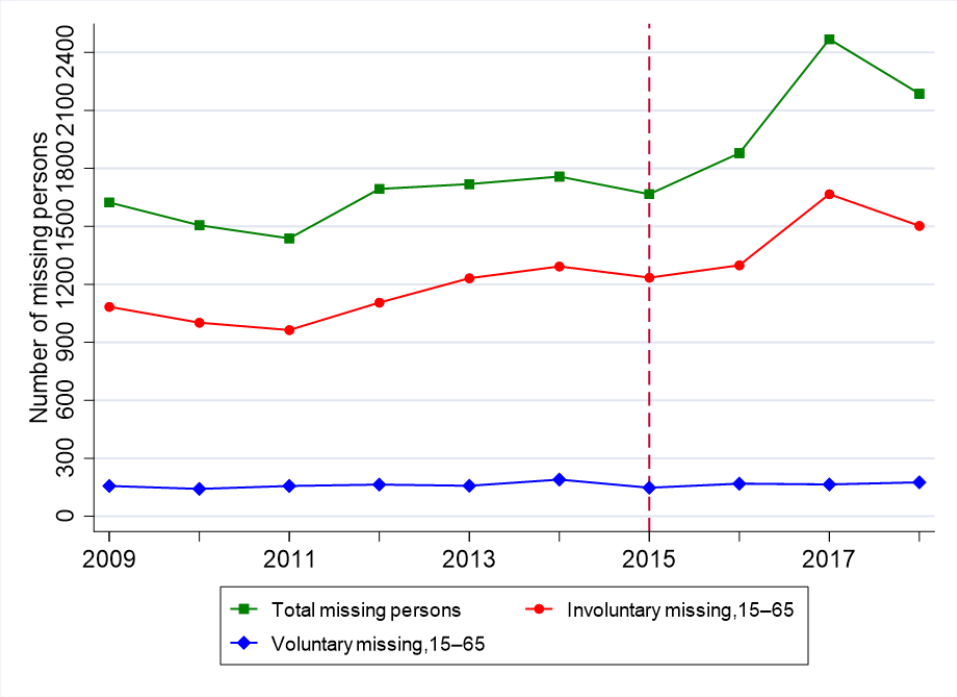
Our analysis reveals a significant increase in the number of missing persons in China after 2015, with the most notable rise among cases potentially related to illegal organ trafficking. Using data from "Baby Come Back Home," China's largest missing person database, Figure 1 illustrates trends in various categories of missing persons from 2009 to 2018. Overall, the total number of missing persons in China increased sharply after 2015. While the number of missing persons unrelated to organ trafficking—such as voluntary disappearances of individuals aged 15–65 (e.g., runaways)—remained relatively stable, the number of involuntary disappearances of individuals in this age group, which are potentially related to illegal organ trafficking, rose significantly.[2]

This increase in involuntary disappearances is particularly concerning, as such cases are typically related to violent crimes (Taylor, Woolnough, and Dickens, 2019), including conflict-induced killings, human trafficking (e.g., forced labor), or murder for organ harvesting. It is plausible that the 2015 abolition of prisoner organ use may have contributed to the observed rise in these disappearances, particularly those associated with organ trafficking.

[1] The data is sourced from a report by Xinhua News Agency, published on March 23, 2012, and featured on the Chinese Central Government's official website. The original article can be accessed via the following link: https://www.gov.cn/jrzg/2012-03/23/content_2098111.htm.

[2] We focus on missing persons aged 15–65, as this age group is most likely to be related to organ trafficking. For further discussions, see Section 3.

Figure 1: Trends in Missing Persons by Category (Total, Voluntary and Involuntary Aged 15–65)



Notes. This figure illustrates the trends in the total number of missing persons, as well as the number of involuntary and voluntary missing persons aged 15–65 from 2009 to 2018. All data on missing persons, unless otherwise noted, are sourced from the "Baby Come Back Home" website.

To examine the impact of the 2015 policy on involuntary missing persons potentially related to organ trafficking, we source missing person data from "Baby Come Back Home," the largest online platform in China dedicated to helping families to find missing relatives. Employing a difference-in-differences (DID) approach at the prefectural level, we compare the pre- and post-2015 changes in missing person cases likely associated with illegal organ trafficking to those unrelated to it. Our DID results indicate that, compared to cases unrelated to organ trafficking (e.g., voluntary disappearances of individuals aged 15–65), the number and incidence of missing persons potentially associated with illegal organ trafficking (i.e., involuntary disappearances of individuals aged 15–65) increased significantly after 2015. Heterogeneous analysis reveals that the effect is significant for adult men but remains relatively minor and often statistically insignificant for adult women. This finding aligns with expectations, as organs from male donors tend to have a lower likelihood of rejection in recipients (Gratwohl et al., 2008), and the majority of executed prisoners have been male.

One major concern regarding our identification is the possibility that other contemporaneous shocks may have also contributed to the observed increase in involuntary missing persons after 2015. For instance, if other policies or unobserved shocks in 2015 heightened social conflict, this could lead

to an increase in missing persons related to conflict-induced murder. Similarly, economic shocks after 2015 could have also resulted in more missing persons associated with forced labor.[3]

To address these concerns, we specifically examine the trend of missing persons with mental illness. Individuals with mental illness are generally more vulnerable and easier to control, making them more likely targets in illegal organ trafficking. Evidence from exposed cases of murder for organ harvesting often identifies mentally ill individuals as victims. Since individuals with mental illness are less likely to be targeted for murder or forced labor, their involuntary disappearances are more plausibly related to illegal organ trafficking. Our analysis reveals that, compared to voluntary missing persons, the number and incidence of involuntary disappearances among mentally ill individuals increased sharply after 2015. This result further supports our hypothesis that the 2015 abolition of using prisoner organs exacerbated the organ shortage, leading to a significant rise in missing persons potentially associated with illegal organ trafficking.

Finally, we examine the heterogeneous effects of the 2015 policy on missing persons across prefectures with and without organ transplant centers. In China, only government-designated organ transplant centers are legally authorized to perform organ transplants. These centers are top-tier institutions, equipped with advanced medical facilities and expertise in organ transplantation. Due to the complexity and resource-intensive nature of organ transplant surgeries, they are primarily conducted at these designated hospitals. The nature of transplant surgeries requires that the location where organs are harvested and transplanted be geographically close, usually within the same prefecture. As a result, organ trafficking is more likely to occur in prefectures with transplant centers.[4] If the 2015 policy exacerbated the organ shortage and contributed to a rise in organ trafficking-related missing persons, this increase should be more pronounced in prefectures with transplant centers.

To test this, we employ a triple-difference strategy by introducing a third dimension of variation at the prefectural level: whether a prefecture has a transplant center and the number of transplant centers it hosts. Our triple-difference estimates indicate that prefectures with transplant centers—or those with a greater number of centers—experienced a more pronounced increase in missing persons potentially related to organ trafficking after 2015 compared to prefectures without such centers. These findings provide additional evidence that the intensified organ shortage caused by the 2015 policy may have contributed to an increase in organ trafficking.

To the best of our knowledge, this paper is the first to empirically examine the relationship between illegal organ trafficking and missing persons. The covert nature of illegal organ trafficking

[3] Although no major economic or non-economic shocks in China likely to affect missing persons were observed between 2015 and 2018, we cannot completely rule out the possibility that unobservable shocks may have played a role. Therefore, this issue warrants careful consideration.

[4] For further discussions on this issue, please refer to Section 2.4.

and the difficulty of obtaining relevant data make empirical research on this issue exceptionally challenging. This study ingeniously leverages the 2015 abolition of using executed prisoners' organs in China as an adverse shock to the supply of transplantable organs, uncovering the impact of the resulting exacerbation of the organ shortage on missing persons potentially related to illegal organ trafficking. By doing so, this study broadens the scope of empirical research in economics and introduces a novel approach to using available data to infer critical yet unobservable economic phenomena.

Our findings contribute to the literature on the unintended consequences of well-intentioned policies. Governments often implement regulations to achieve specific public policy goals, but these policies can sometimes result in unforeseen negative outcomes (e.g., Billings, Deming, and Rockoff 2014; Dell, 2015; Diamond, McQuade, and Qian, 2019; Sviatschi, 2022; Cameron, Seager, and Shah, 2021). For instance, policies aimed at reducing sexually transmitted diseases in developing countries by regulating sex work have paradoxically increased the likelihood of infection among both sex workers and the general population (Cameron, Seager, and Shah, 2021). Similarly, crackdowns on drug smuggling, intended to curb trafficking, have often led to a rise in drug-related violence (Dell, 2015). Our findings highlight an even more alarming scenario: while the policy to stop the use of prisoner organs was well-intentioned, it exacerbated the organ shortage, creating incentives for criminals to commit murder for organ harvesting. This resulted in far more severe consequences than originally anticipated.

Additionally, this study contributes to the literature on the economics of crime, particularly regarding the causes of crimes and incentives behind criminal activities (e.g., Becker, 1968; Glaeser, Sacerdote, and Scheinkman, 1996; Freeman, 1999; Glaeser and Sacerdote, 1999; Aizer and Doyle, 2015; Levitt, 2017). In particular, our findings enhance the public's understanding of a covert and heinous crime—trafficking in human beings for the purpose of organ removal. Knowledge and awareness of these crimes remain limited among scholars, law enforcement, and potential victims, resulting in many cases going unnoticed or unprosecuted (Ambagtsheer et al., 2016; Ambagtsheer 2021). Our findings provide valuable insights into the patterns of these crimes, raising awareness among the public and informing relevant policies to address this issue.

Furthermore, this study contributes to the literature on the social costs of shortages. While extensive research has examined the economic costs of goods shortages in non-free markets (Hare 1982, 1989; Osband, 1992; Glaeser and Luttmer, 2003; Diamond, McQuade, and Qian, 2019), the broader non-economic social costs of such shortages remain relatively underexplored. Our findings reveal that the shortage of critical goods can have severe and unexpected consequences, such as the rise of violent crimes associated with underground trafficking. These results suggest that the traditional

estimates of the costs of goods shortages may significantly underestimate their broader societal impacts.

2. Background

2.1 Transplant Organ Market: A Global Perspective

In 1983, the U.S. Food and Drug Administration approved cyclosporine for use in suppressing transplant rejection,[5] overcoming one of the primary obstacles in organ transplantation (Colombo and Ammirati, 2011). This breakthrough established organ transplantation as an effective treatment for a wide range of diseases (Colombo and Ammirati, 2011). However, the subsequent surge in global demand for organ transplants created an increasing imbalance between organ supply and demand.

Due to ethical considerations, most countries have implemented strict regulations on organ transactions, making voluntary and unpaid donations the only legal source of organ supply, whether from living donors or posthumous donations. However, voluntary donations face the inherent challenge of insufficient donor incentives, leading to a persistent supply shortage. To address this issue, many countries have introduced policies to encourage citizens to agree to posthumous organ donation. For instance, the U.S. government encourages citizens to sign organ donation agreements by offering benefits such as tax deduction for costs incurred due to the organ donation (Wellington and Sayre, 2011). Some European countries, including Spain and Belgium, have adopted "opt-out" policies, under which all citizens are presumed to consent to posthumous organ donation unless they explicitly opt out (Arshad, Anderson, and Sharif, 2019; The Lancet, 2024).

Thanks to its well-structured organ donation system and the high willingness of its citizens to donate, Spain has consistently led the world in organ donation rates for many years. By 2023, Spain's annual donation rate had reached 49.61 donors per million people. The United States ranked second globally, with a donation rate of 38 donors per million.[6] However, despite this achievement, the organ supply-demand ratio in the U.S. remains as high as 1:4. This highlights that even in countries with the highest donation rates, organ shortages remain a significant challenge.

2.2 China's Organ Market: Background and Policy Change

The organ shortage in China has been particularly severe. For many years, the number of voluntary organ donations has remained extremely low, largely due to the conflict between organ

[5] Transplant rejection refers to the immunological response in which the recipient's immune system recognizes the transplanted tissue or organ from a donor (allograft) as a "foreign" component and initiates an attack to damage, destroy, and eliminate the transplant.
[6] The data is sourced from International Registry on Organ Donation and Transplantation. For more information, please visit https://www.irodat.org/.

donation and traditional Chinese cultural values. Chinese culture places great importance on preserving the integrity of the body even after death, a belief rooted in notion that "one's body is a gift from their parents and should not be harmed." Organ donation is often perceived as a violation of this principle, making it seem disrespectful and sacrilegious.

This cultural perspective has significantly limited public support for posthumous organ donation in China. Additionally, public awareness campaigns promoting voluntary organ donation began relatively late, and the lack of accessible information on the subject has left most people unfamiliar with the concept. As a result, awareness and willingness to donate organs have remained markedly low. By 2010, the organ donation rate in China was just 0.02 per million people,[7] in stark contrast to 25 in the U.S., an average of 18.4 across the European Union, and over 30 in Spain since 1998.[8]

Due to the limited number of voluntary donations, China's organ transplant system relied heavily on executed prisoners for an extended period. On October 9, 1984, the Chinese government discreetly issued the *Interim Provisions on the Use of Corpses or Organs of Executed Prisoners*, which permitted hospitals to use unclaimed bodies of executed prisoners or those whose families had provided consent for medical purposes (Rothman et al., 1997). As a result, organs from executed prisoners became the primary source of transplant organs in China, accounting for over 95% of the total supply (Huang, 2007).

However, as it was difficult to ensure that donations from death-row prisoners were truly voluntary, this practice raised significant human rights concerns and drew widespread international condemnation. For a long time, the Chinese government remained evasive about the sources of transplant organs, neither confirming nor denying the judicial use of prisoner organs, which further fueled international suspicions. It was not until 2005 that Chinese officials publicly acknowledged the practice (Sharif et al., 2014). This admission prompted strong objections from the Transplantation Society (TTS), which imposed an academic embargo, prohibiting Chinese physicians involved in this practice from presenting at international congresses, publishing in medical journals, and obtaining membership in TTS (Delmonico et al., 2014).

Facing growing pressure from international communities, the Chinese government sought to align with international standards by transitioning its organ procurement system entirely to voluntary donations, thereby reducing reliance on organs from death-row prisoners. This shift required the establishment of a mature organ donation and allocation system, which had not existed before 2010.

[7] The data is sourced from the *China Organ Transplant Development Report (2020)*.
[8] The data is sourced from International Registry on Organ Donation and Transplantation. For more information, please visit https://www.irodat.org/.

In March 2010, the Red Cross Society of China, commissioned by the Ministry of Health, launched pilot programs for posthumous organ donation across the country. By February 2013, these programs had been fully implemented nationwide. To further support this transition, the China Organ Donation and Transplantation Management Center was established in July 2012 to oversee key aspects of organ donation operations. These included public awareness campaigns, donor registration, donation witnessing, equitable organ allocation, donor incentives, commemorative activities, and the development of information platforms. The center officially began operations in January 2013.

While these efforts showed some progress, they were insufficient to significantly alleviate the severe organ shortage in China. Statistics reveal that since the pilot program began in 2010, the annual organ donation rate per million people increased from 0.02 in 2010 to 1.2 in 2014,[9] with a total of 1,611 donations completed during this period. However, this modest improvement fell far short of meeting the needs of millions of patients requiring transplants each year. A spokesperson for the Red Cross Society of China acknowledged that, despite these advancements, they represented only "the first step in a long journey" and were inadequate to resolve the nationwide organ shortage.[10]

Despite China's organ donation system being in its infancy and the number of donations still falling far short of demand, the Chinese government decided to expedite the abolition of prisoner organ use. In December 2014, at the *China Organ Procurement Organization Alliance Symposium* in Kunming, Huang Jiefu, head of the China Organ Donation and Transplantation Committee, announced that as of January 1, 2015, China would completely cease the use of organs from executed prisoners, transitioning to rely solely on voluntary donations for transplants.

This policy represented a significant shift in the government's stance on the judicial use of prisoner organs and aligned China with international standards of transplant practice.[11] In response, the TTS lifted its academic embargo on China, allowing the country to re-engage in international discussions and collaborations on organ transplantation, signaling international approval of the policy (Huang and Ye, 2017).

While the policy was well-intentioned, the abrupt termination of China's primary source of transplant organs, amid an already severe shortage, inevitably created a major supply shock. In a market characterized by highly inelastic demand for organs, a significant reduction in supply was

[9] The data is sourced from the *China Organ Transplant Development Report (2020)*.

[10] For more information, please visit https://www.gov.cn/xinwen/2014-04/02/content_2652118.htm.

[11] Some scholars have raised concerns about whether the policy can fully eliminate the use of organs from executed prisoners (e.g., Allison et al., 2015). They argue that the Chinese government did not explicitly prohibit organ donations from death-row inmates, which means that these prisoners, like other citizens, retain the right to voluntarily donate their organs. Consequently, whether the policy can completely eradicate the coercive use of organs from prisoners remain questionable. Nevertheless, other scholars view this policy as a very positive step forward, reflecting the Chinese Government's commitment to addressing international concerns and ending the widely denounced practice (The Lancet, 2015). As Chinese official Huang Jiefu stated, "I can't say that after January 1, 2015, there won't be even a single case, but we will certainly succeed because the government supports the enforcement of the law" (American Journal of Transplantation, 2015).

likely to drive up black-market prices, substantially increasing profit margins for illegal organ trafficking and potentially fueling a rise in violent crimes related to organ harvesting.

2.3 Human Organ Trafficking in China

There are three primary sources for obtaining transplantable organs: (1) voluntary organ donations, (2) voluntary but illegal organ trade on the black market, and (3) organs acquired through violent crimes. In China, the number of voluntary donations has been extremely low, falling far short of meeting the substantial demand for organs. This shortage has likely fueled the rise of illegal organ trafficking.

While voluntary trade on the black market may satisfy some of the demand for transplantable organs, the supply through these means remains limited. First, because voluntary organ transactions are illegal, both buyers and sellers face the risk of legal penalties if caught, significantly curbing the scale of such transactions. Second, the high cost of black-market organs—such as kidneys priced up to 200,000 RMB (Gong, 2013)—limits the number of potential buyers. Lastly, organ sales are typically confined to kidneys and livers, where the seller can survive the removal of one or part of the organ. In contrast, organs such as hearts and lungs cannot be sold, as their removal would result in the seller's death, making such transactions impossible.

Given the limitations of voluntary donations and black-market transactions, acquiring organs through criminal means, such as murder for organ harvesting, may have emerged as a third major source. While the notion of murder for organ harvesting may seem unimaginable, it has deeper, systemic causes. Human trafficking, particularly involving children and young women, has long been a persistent issue in China (Zheng, 2018). Driven by market demand for child adoption and brides, this illicit trade incentivizes criminals to take significant risks for profit. Despite government efforts to combat human trafficking, these illegal activities continue to persist.

Similarly, the lucrative nature of China's organ market provides substantial financial incentives, driving some criminals to resort to extreme actions such as murder for organ harvesting. This issue highlights the power of market forces, where the overwhelming demand for organs, coupled with the potential for significant profit, fuels the emergence of heinous crimes associated with organ trafficking. Exposed cases have provided critical insights into the severity and systemic nature of this issue.

One particularly notable case, reported by Wang (2007), occurred in 2006 in Xingtang County, Hebei Province, where a beggar was murdered for his organs. Wang Zhaoyang, a local villager deeply in debt after a series of failed business ventures, was desperate for financial opportunities. Learning about the high demand for human organs, Wang contacted Chen Jie, a doctor at a transplant hospital, falsely claiming to have access to organs from executed prisoners.

In 2006, Wang abducted a beggar with mental illness and imprisoned him in an abandoned power station on the outskirts of Xingtang County. With Chen Jie's assistance, they conducted blood typing and tissue matching on the beggar. On November 15, a group of doctors, including Chen Jie, conducted a rushed surgery at the power station, harvesting the beggar's kidneys, liver, pancreas, and spleen. Wang received a large payment for the harvested organs.

The case was exposed only because one of the doctors involved turned himself in. Without this confession, many similar cases would have remained undiscovered, allowing the perpetrators to continue their crimes unchecked. This incident highlights the covert and dangerous nature of illegal organ trafficking and its devastating consequences.

Many Chinese people strongly believe in the existence of murder for organ harvesting, and unsolved cases of missing youth are often speculated to be linked to such crimes. Since October 2022, there have been dozens of cases involving missing youth across China, many of which are believed to be related to organ trafficking. One particularly notable case that has garnered widespread attention is that of Hu Xinyu. On October 14, 2022, Hu, a 15-year-old high school student at Zhiyuan Middle School in Shangrao, Jiangxi Province, mysteriously disappeared from his school. At the time of his disappearance, all of the school's surveillance cameras inexplicably malfunctioned, leaving no video evidence of the event.

In the months that followed, the local government organized an extensive search operation involving thousands of people combing the school grounds and surrounding areas, but no clues were uncovered. As online discussions grew, speculation intensified, with many suggesting that Hu had been murdered for his organs. Disturbing messages circulated, claiming that Hu had been specifically admitted to the school because his blood type matched someone in need of an organ, and that he disappeared shortly after his enrollment. This case has sparked widespread public concern and intense debate over the potential links between missing persons and illegal organ trafficking in China.

On January 29, 2023, the decomposed body of Hu Xinyu was discovered hanging from a tree in a small forest near his school, over three months after his disappearance. Despite earlier extensive searches in the area, the body had inexplicably gone undetected until that point. This fueled widespread speculation online, with some suggesting that Hu's body had been recently placed there to quell the public crisis surrounding his disappearance.

The government's official report concluded that Hu had died by suicide due to academic pressure, with his body and organs intact. However, many found this explanation suspicious, raising numerous questions about inconsistencies and gaps in the investigation. Despite these concerns, voices

challenging the official narrative were silenced by government censorship. Over time, the controversy surrounding Hu's disappearance gradually subsided as a result of official intervention.[12]

The truth behind Hu Xinyu's case remains unknown. While it is possible, as the official report states, that his disappearance was unrelated to illegal organ trafficking, the widespread online discussion highlights that many Chinese citizens strongly believe in the existence of organ-harvesting crimes and harbor deep fear about such incidents. These beliefs likely originate from personal experiences or a broader understanding of societal vulnerabilities in China.

This study aims to rigorously examine whether these fears are supported by empirical evidence. If illegal organ trafficking has persisted over time due to a chronic organ shortage, the abrupt and substantial reduction in organ supply following the 2015 abolition of using prisoner organs may have exacerbated the shortage, potentially leading to an increase in such crimes. By exploiting China's 2015 policy change as an adverse supply-side shock, this study seeks to empirically analyze its impact on illegal organ trafficking and related criminal activities.

2.4 Organ Transplant Centers and Illegal Organ Trafficking

In China, only hospitals officially designated by the government as organ transplant centers are legally authorized to perform organ transplants. These hospitals are typically top-tier medical institutions, selected through a rigorous evaluation process and equipped with state-of-the-art medical facilities and expertise in organ transplantation. As of 2015, there were 169 hospitals listed as organ transplant centers across the country, with such hospitals located in 60 cities.[13]

Due to the complexity of organ transplant surgeries and the specialized resources required, these procedures generally need to be performed at designated transplant centers. This raises concerns that these hospitals may source organs from illegal trafficking networks. Driven by the high profits associated with organ transplants, hospitals may have strong incentives to use organs from illegal sources. This is a global issue. As the literature suggests, hospitals in many countries have resorted to using organs from illegal sources, such as paid donors, while falsely claiming that the organs were voluntarily donated by the patients' relatives (Scheper-Hughes, 2000). In some cases, doctors act as brokers for organ trafficking organizations, and hospitals compete to attract wealthy patients (Scheper-Hughes, 2003). There have been even instances where hospitals directly assisted organ trafficking organizations, participating in illegal activities themselves (Ambagtsheer, 2021).

A similar situation has been observed in China. Although Chinese regulations require transplant centers to verify the legality of organ sources before proceeding surgeries, enforcing these regulations

[12] For more details about this case, please visit the following link: https://zh.wikipedia.org/wiki/胡鑫宇事件.
[13] For the list of these hospitals, please visit http://www.nhc.gov.cn/yzygj/s3594q/201510/2c5551f6b36340a7b520d8e205ecbcbc.shtml.

is often challenging. Transplant centers are required to meet minimum annual surgery quotas, and transplant surgeons' income is tied to the number of surgeries they perform. This creates strong incentives for both transplant centers and surgeons to maximize the number of transplants. In cases where illegal organ trafficking was exposed, traffickers often claimed that the organs were voluntarily donated by the patients' relatives, and these claims were frequently accepted by transplant centers. In some cases, transplant surgeons themselves sought illegal organ sources from traffickers to meet their surgery quotas. While organ traffickers were severely punished in these cases, hospitals and doctors involved in such practices were not held accountable, revealing legal gaps that have facilitated organ trafficking (Gong, 2013).

The nature of transplant surgeries dictates that the location where organs are harvested and transplanted must be geographically close. A successful organ transplant involves two critical steps: (1) harvesting the organs from the donor, a relatively simple process that does not require a highly specialized facility, and (2) transplanting the organs into the recipient, which is a more complex procedure typically requiring the advanced equipment and expertise at a transplant center.[14] The success of the procedure is highly dependent on efficient time management during two critical phases. The first is the "warm ischemia" phase, which spans from the donor's cardiac arrest to the start of cold perfusion and should not exceed 60 minutes (Halazun et al., 2007; Marasco et al., 2012; Tennankore et al., 2016). The second is the "cold ischemia" phase, the time between organ removal and transplantation, which typically should not exceed 24 hours. For example, kidneys can be preserved for up to 24 hours, livers for up to 12 hours, lungs for 8–12 hours, and hearts for 6–8 hours (Hu et al., 2015; Sibulesky et al., 2016; Nieto-Ríos et al., 2019; Villavicencio et al., 2021). Even within the tolerable ischemic time, longer ischemia duration generally leads to poorer organ quality and worse prognosis for the recipient (Halazun et al., 2007; Ponticelli, 2015; Tennankore et al., 2016).

These time constraints necessitate that the location where organs are harvested and transplanted be geographically close, usually within the same prefecture. While it is theoretically possible for traffickers to abduct organ donors from one location and transport them to another for harvesting and sale, the risks associated with long-distance transportation—such as the possibility of escape or alerting authorities—make this a less common approach. In instances of exposed illegal organ trafficking, the abduction, harvesting, and transplantation typically occurred within the same prefecture.

Since transplant surgeries are generally performed at organ transplant centers, organ trafficking is more likely to occur in prefectures with such centers. Consequently, cases of missing persons related

[14] The information comes from a notice on the Ministry of Health website of the central government portal of China. For more details, please visit https://www.gov.cn/gzdt/2006-03/27/content_237610.htm.

to organ trafficking are more likely to occur in such prefectures. If the 2015 policy exacerbated the organ shortage and led to an increase in organ trafficking-related disappearances, this increase should be more pronounced in prefectures with transplant centers. To examine this, we introduce a third dimension of variation at the prefectural level: whether a prefecture has a transplant center and the number of transplant centers it has. Building on our difference-in-differences estimates, we employ a triple-difference model to examine whether prefectures with transplant centers—or prefectures with a higher number of centers—saw a greater increase in organ trafficking-related disappearances after 2015, compared to prefectures without such centers.

3. Data

3.1 Data Source and Description of Statistics

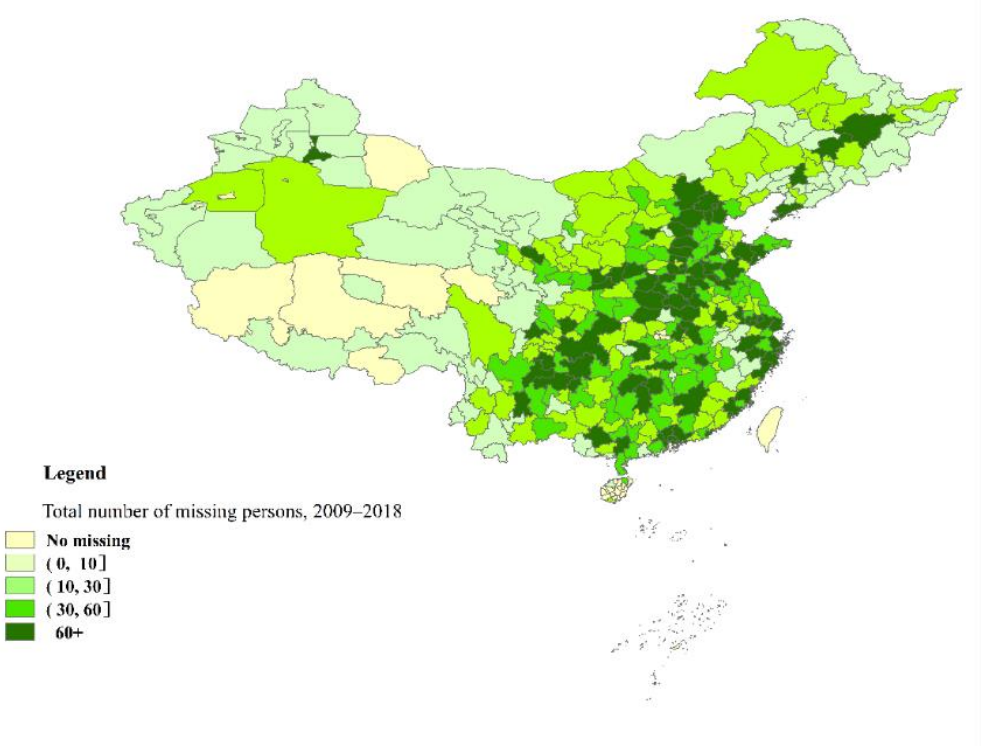
Given that official information on missing persons in China is generally unavailable, we source our data on missing persons from the Baby Come Back Home (BCBH) website (https://baobeihuijia.com/bbhj/). BCBH is the largest online platform in China dedicated to assisting families to find missing relatives. Established in 2007, the platform initially focused on helping families find missing children but soon expanded to cover all types of missing persons, with the majority of the records now pertaining to missing adults. Since 2009, BCBH has partnered with the Ministry of Public Security in efforts to search for missing persons, enhancing the reliability and quality of its data (Bao et al., 2023). For this study, we use records from 2009 onward.

The BCBH website has developed a robust nationwide network for searching missing persons, supported by nearly 400,000 volunteers across China. Families seeking assistance can submit information about a missing person to BCBH either online or via a hotline. Volunteers verify the details with both the family and local authorities to avoid false reporting. Once verified, the case is added to the database and shared on the website's forum section, where visitors can view and disseminate the information (Bao et al., 2023).

In February 2023, we crawled all available records of missing persons from the official BCBH website, compiling a raw dataset of 162,462 records. Figure A1 provides an example of a typical case report. Each report contains two main components: (1) information about the missing person, including their name, gender, date of birth, height at the time of disappearance, and the date and location of their disappearance; and (2) a descriptive text outlining the person's physical characteristics and additional details regarding the incident, such as the circumstances and possible reasons for their disappearances. These records serve as the foundation for our empirical analysis of missing persons.

We follow several steps to clean the raw dataset. First, we eliminate duplicate reports of the same missing individual. Second, we remove records unrelated to the focus of this study, such as cases of assistance for tramps and beggars to return home, efforts to help martyrs find their hometowns, reconnecting with lost friends, and cases involving abandoned children. Third, we restrict our sample to cases where the year of disappearance falls between 2009 and 2018.[15] This process yields a final dataset of 18,336 records, with 13,241 (72%) cases involving individuals aged 18 or older, and 5,095 cases involving minors. Figure 2 illustrates the distribution of missing persons across the country, highlighting substantial regional variations.

Figure 2: Spatial Distribution of Missing Persons



Notes. This map illustrates the spatial distribution of missing person incidents across prefectures in China from 2009 to 2018, with the severity categorized into five levels based on the number of incidents.

Considering that missing persons with mental illness may have distinct circumstances and reasons for disappearance compared to those without, we categorize the missing persons into two groups: those with mental illness (mentally ill sample) and those without (basic sample). This approach allows us to capture the distinct patterns and causes of disappearances within each group, providing a more nuanced and comprehensive analysis.

We first analyze the descriptive text of each missing incident to determine whether the individual has a mental illness. If the text contains any terms indicating a mental health condition—such as

[15] We do not extend the analysis beyond 2018 to avoid potential confounders, such as the COVID-19 pandemic, which may have also influenced the incidence of missing persons. Fully accounting for these impacts would be challenging.

"mental illness," "neurological disorder," or "dementia"—we classify the individual as having a mental illness; otherwise, we assume they have no mental health issues.

Table 1: Summary Statistics for the Main Variables

	(1) Obs	(2) Mean	(3) SD	(4) Min	(5) Max
Panel A: Number of missing persons					
Basic sample					
Involuntary 15–65	3330	3.26	7.082	0	81
Male	3330	2.962	6.659	0	70
Female	3330	0.298	0.755	0	14
Voluntary 15–65	3330	0.412	0.851	0	9
Male	3330	0.377	0.812	0	9
Female	3330	0.035	0.192	0	2
Mentally ill sample					
Involuntary 15–65	3330	0.456	1.129	0	17
Voluntary 15–65	3330	0.076	0.29	0	3
Panel B: Incidence of missing persons					
Basic sample					
Involuntary 15–65	3290	0.085	0.131	0	1.676
Male	3290	0.149	0.233	0	2.668
Female	3290	0.017	0.044	0	0.599
Voluntary 15–65	3290	0.012	0.025	0	0.306
Male	3290	0.021	0.048	0	0.641
Female	3290	0.002	0.012	0	0.166
Mentally ill sample					
Involuntary 15–65	3290	0.012	0.027	0	0.465
Voluntary 15–65	3290	0.002	0.009	0	0.162
Panel C: Organ transplant center					
CenterCity	333	0.183	0.387	0	1
CenterNum	333	0.523	1.732	0	20

Next, we examine the same text to categorize each case as either voluntary or involuntary. Specifically, if the text contains clear indicators of voluntary departure—such as phrases like "ran away," "hiding," or "left in anger"—we classify the case as a voluntary disappearance, suggesting that

the individual chose to cut off contact with family members. If no such indicators are found, we classify the case as an involuntary disappearance. Involuntary cases are typically associated with criminal activities, such as illegal organ trafficking, and often occur without warning signs. In contrast, voluntary disappearances are generally unrelated to criminal behavior.

The detailed procedures for identifying both the mental health status and the type of disappearance of individuals are provided in the Appendix.

Considering our focus on missing persons potentially related to organ trafficking and recognizing that the medically recommended optimal age range for organ donors is 18–65 years (Øien et al., 2007), we primarily focus our analysis on missing persons within this age range. However, in light of the widely publicized Hu Xinyu case—where a 15-year-old was believed to have been murdered for his organs, reflecting a prevailing belief that individuals as young as 15 may be considered viable organ donors—we have extended our analysis to also include missing persons aged 15–17.[16]

We have two main dependent variables at the prefectural level: the annual number of missing persons and the incidence of missing persons, measured as the number of missing persons per million population. Table 1 presents the summary statistics for these key variables. Panels A and B display the statistics for the number and incidence of different types of missing persons, respectively. Notably, both the number and incidence of missing persons for males are significantly higher than for females.[17] Panel C provides the summary statistics for the presence of organ transplant centers in a prefecture and the number of centers within each prefecture. *CenterCity* is a binary variable that equals 1 for prefectures with transplant centers and 0 otherwise, with the mean and standard deviation being 0.183 and 0.387, respectively. *CenterNum* represents the number of transplant centers in a prefecture, with a mean of 0.523 and a standard deviation of 1.732.

3.2 Potential Reporting Issues

Due to the reporting feature of the BCBH, the data captures only a fraction of all missing person cases in China. This raises potential concerns about underreporting, which could undermine the validity of the data. However, several studies have used this data to examine the issue of missing children (Wang et al., 2018; Bai et al., 2022; Bao et al., 2023), addressing the challenges associated

[16] Medical studies have shown that organs from older donors, particularly those over 65, tend to result in poorer transplant outcomes for recipients (e.g., Oppenheimer, 2004; Øien et al., 2007; Lué et al., 2016; Dayoub et al., 2018). However, organs from individuals over 65 are not automatically rejected in clinical practice. For instance, the Spanish Liver Transplant Registry reports the use of liver transplants from donors aged 75 and older (Lué et al., 2016). This study primarily focuses on missing persons aged 15–65, as organs from this age group are generally more suitable for transplantation and hold greater value in the organ market. Nevertheless, it is important to note that individuals over 65 could also fall victim to organ trafficking.

[17] This finding is consistent with reports from the United Nations Working Group on Enforced or Involuntary Disappearances (WGEID), which estimates that men comprise between 70 to 94 percent of those who have been disappeared globally. For further details, please visit the following website: https://icmp.int/news/gender-and-the-missing/.

with potential underreporting and misreporting. These studies argue that the limitations in reporting do not significantly compromise their findings.

In the context of our DID and DDD frameworks, reporting issues are unlikely to pose a severe threat to our identification. Potential issues would arise only if patterns of underreporting varied systematically across different types of missing persons, regions, and over time. For instance, if underreporting of involuntary missing persons became less severe compared to voluntary cases after 2015, this could lead to an inflated DID estimate. Similarly, if underreporting of involuntary cases in prefectures with transplant centers became less severe than in those without transplant centers after 2015, it could distort the DDD estimate. However, given the high consistency in BCBH's reporting practices across missing person types, regions, and over time, such scenarios are unlikely.

In other words, the substantial increase in involuntary missing persons after 2015, relative to the stable trend in voluntary cases, is unlikely to be driven by underreporting bias. Likewise, the sharp rise in involuntary missing persons in prefectures with transplant centers, compared to those without, is unlikely to result from reporting bias. Therefore, we need not be overly concerned that potential underreporting bias would undermine the validity of our identification.

4. Empirical Strategy

4.1 Difference-in-Differences

We employ a difference-in-differences model to identify the impact of the 2015 abolition of using prisoner organs on involuntary missing persons. Specifically, we examine whether the number and incidence of involuntary disappearances potentially related to organ trafficking increased significantly, relative to voluntary missing cases, following the 2015 policy change. To test this, we estimate the following equation:

$$Missing_{pct} = \beta Organ_c \times Post2015_t + \alpha_{pc} + \alpha_{pt} + \epsilon_{pct}, \quad (1)$$

where *p* and *t* represent prefecture-level city and year, respectively, and *c* denotes the type of missing persons (involuntary or voluntary missing). $Missing_{ptc}$ measures the number or incidence of missing persons of type *c* in prefecture *p* during year *t*. $Organ_c$ is a dummy variable that equals 1 for involuntary missing persons and 0 otherwise. $Post2015_t$ is a dummy variable that equals 1 for the year 2015 and all subsequent years, and 0 otherwise. Standard errors are clustered at the provincial level.

Note that our panel is perfectly balanced, with exactly one treatment and one control observation for each prefecture-time pair. Since the identification of the treatment effect relies primarily on the

differences between involuntary and voluntary missing persons, it is not strictly necessary to control for prefecture or time fixed effects. Instead, we only need to control for the two dummy variables, $Organ_c$ and $Post2015_t$. However, including these fixed effects may enhance the precision of our estimates. To account for this, we control for prefecture-by-missing type fixed effects (α_{pc}) and prefecture-by-year fixed effects (α_{pt}). As we demonstrate later, the estimates of the coefficient β remains similar whether or not these fixed effects are included. Therefore, we present results that control for all fixed effects in the subsequent analysis.

The coefficient of interest, β, captures the causal effect of the 2015 abolition of using prisoner organs on organ trafficking-related missing persons. A significantly positive β indicates a substantial increase in involuntary missing persons compared to voluntary missing cases following the 2015 policy change. Intuitively, if this policy exacerbates organ shortage, we would expect to observe a relative increase in involuntary missing persons potentially related to organ trafficking, as compared to voluntary missing cases, in the post-2015 period.

4.2 Event Study

The difference-in-differences strategy relies on the common trends assumption, which posits that, in the absence of the 2015 policy, the number or incidence of involuntary and voluntary missing persons would have followed parallel trends. Several figures are plotted to show the annual number of involuntary and voluntary missing persons across the country, all of which indicate that the two groups followed a common trend prior to 2015. To further validate this parallel trends assumption, we employ an event study approach. Specifically, we estimate the following equation to capture the dynamics of missing persons before and after 2015:

$$Missing_{pct} = \sum_{t=2009}^{t=2018} \beta_t Organ_c \times Year_t + \alpha_{pc} + \alpha_{pt} + \epsilon_{pct}, \quad (2)$$

Where p, c and t represent prefecture-level city, missing type, and year, respectively. $Year_t$ is a vector of indicators for each year from 2009 to 2018. The coefficients of interest, β_t, take on a unique value for each year from 2009 to 2018, capturing the differences between involuntary and voluntary missing persons in each year. The base year is 2014, the year prior to the 2015 policy. As is standard in event study analysis, we set β_{2014} = 0, so that all coefficients represent differences in missing persons relative to the year 2014. The fixed effects are consistent with those in Equation (1), and standard errors are clustered at the provincial level. If the parallel trends assumption holds, the estimated coefficients (β_t) should not be statistically different from zero for each $t \leq 2014$.

4.3 Triple Difference

Since transplant surgeries are generally performed in designated organ transplant centers, organ trafficking is more likely to occur in prefectures with these facilities. If the 2015 policy exacerbated the organ shortage and subsequently led to an increase in trafficking-related disappearances, this trend should be more pronounced in prefectures with transplant centers. To test this, we employ a triple-difference model to examine whether prefectures with transplant centers—or those with a greater number of centers—experienced a larger increase in organ trafficking-related disappearances after 2015, compared to prefectures without such centers. Specifically, we estimate the following equation:

$$Missing_{pct} = \beta Organ_c \times Post2015_t \times Center_p + \alpha_{pc} + \alpha_{pt} + \alpha_{ct} + \epsilon_{pct}, \quad (3)$$

where p, c, and t represent prefecture, missing type, and year, respectively, as defined above. $Center_p$ is an indicator variable that takes a value 1 for prefectures with transplant centers and 0 otherwise (or alternatively, it can represent the count of such centers). In addition to prefecture-by-missing-type fixed effects (α_{pc}) and prefecture-by-year fixed effects (α_{pt}), which are controlled for in the difference-in-differences model, we also include missing-type-by-year fixed effects (α_{ct}). Standard errors are clustered at the provincial level.

5. Results

5.1 Baseline DID Results

We begin by presenting the benchmark DID estimates of the effect of the 2015 policy on involuntary missing persons. As shown in Figure 1, while the number of voluntary missing persons aged 15–65 remained relatively stable over time, the number of involuntary missing persons in the same age group—who are more likely associated with illegal organ trafficking—increased significantly following the implementation of the policy. This observed pattern supports the validity of the common trends assumption underlying the DID strategy.

Our analysis focuses on the basic sample, which includes all voluntary and involuntary missing persons without mental illness. Specifically, we use involuntary missing persons aged 15–65 as the treatment group and voluntary missing persons aged 15–65 as the control group. We estimate Equation (1) and present the results in Table 2. Column (1) reports the estimates without any fixed effects, while Column (2) presents results with controls for prefecture-by-missing-type fixed effects and prefecture-by-year fixed effects. The estimates remain consistent across these specifications.

The coefficient of interest is 0.709, significant at the 1% level, indicating that, on average, each prefecture experienced 0.709 more involuntary missing persons compared to voluntary missing persons after 2015. Considering that the mean annual number of missing persons across all prefectures is 1.836, this estimate suggests that the 2015 policy led to an approximate 39% (0.709/1.836) increase in involuntary missing persons relative to the sample mean.

Similarly, Columns (3) and (4) present the results for an alternative measure: the incidence of missing persons, calculated as the number of missing persons per million population.[18] The corresponding coefficient is 0.014, which is also significant at the 1% level. This indicates that, on average, each prefecture experienced a 0.014 higher incidence of involuntary missing persons compared to voluntary missing persons after 2015. This estimate suggests that the 2015 policy led to an approximate 29% (0.014/0.048) increase in the incidence of involuntary missing persons relative to the sample mean.

Our results remain robust when using Poisson or negative binomial regressions to account for count outcome variables. The results of these robustness checks are presented in Tables A1 and A2 in the Appendix.

Table 2: DID Estimates of the Effect of the 2015 Policy on Involuntary Missing Persons

Dependent Variable	Number of missing persons		Incidence of missing persons	
	(1)	(2)	(3)	(4)
$Post2015_t \times Organ_c$	0.709***	0.709***	0.014***	0.014***
	(0.149)	(0.149)	(0.004)	(0.004)
$Organ_c$	Yes	No	Yes	No
$Post2015_t$	Yes	No	Yes	No
Prefecture FE×Organ FE	No	Yes	No	Yes
Prefecture FE×Year FE	No	Yes	No	Yes
Observations	6,660	6,660	6,580	6,580
R^2	0.076	0.956	0.131	0.904
Mean Dependent Var.	1.836	1.836	0.048	0.048

Notes. This table reports the DID estimates of the 2015 policy's effect on involuntary missing persons, specifically presenting the estimated coefficients (β) from Equation (1). The treatment group consists of involuntary missing persons without mental illness aged 15–65, while the control group comprises corresponding voluntary missing persons. Columns (1) and (3) report results only controlling for the dummy variables $Organ_c$ and $Post2015_t$, without any fixed effects, while Columns (2) and (4) include prefecture-by-missing-type fixed effects and prefecture-by-year fixed effects. Standard errors in parentheses are clustered at the provincial level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

[18] We derive the population size of different age groups across all prefectures from the 2015 census data. Further details can be found in the Appendix.

5.2 Heterogeneous Analysis

Exposure to organ trafficking may vary significantly across demographic groups. In this section, we explore this heterogeneity by analyzing the differential effects of the 2015 policy on missing persons across gender and age groups.

5.2.1 Gender Differences

We first estimate Equation (1) separately for male and female samples to examine the potential gender differences in the policy's impact on involuntary missing persons. Table 3 presents the results. While the coefficients for both the number and incidence of missing persons in the male sample are large and statistically significant at the 1% level, the corresponding coefficients in the female sample are much smaller and statistically insignificant.

For the male sample, Column (1) shows a coefficient of 0.665 for the number of missing persons, suggesting that, on average, each prefecture experienced 0.665 more involuntary missing males compared to voluntary missing males after 2015. This represents an approximate 40% (0.665/1.67) increase relative to the sample mean. Similarly, Column (3) reports a coefficient of 0.260 for the incidence of missing persons, corresponding to an approximate 31% (0.260/0.849) increase relative to the sample mean.

Table 3: DID Estimates of the Effect of the 2015 Policy on Involuntary Missing Persons, by Gender

Dependent Variable	Number of missing persons		Incidence of missing persons	
	Male	Female	Male	Female
	(1)	(2)	(3)	(4)
$Post2015_t \times Organ_c$	0.665***	0.043	0.260***	0.008
	(0.136)	(0.030)	(0.060)	(0.021)
Prefecture FE×Organ FE	Yes	Yes	Yes	Yes
Prefecture FE×Year FE	Yes	Yes	Yes	Yes
Observations	6,660	6,660	6,580	6,580
R^2	0.957	0.705	0.899	0.623
Mean Dependent Var.	1.670	0.166	0.849	0.097

Notes. This table reports the DID estimates of the 2015 policy's heterogeneous effects on male and female involuntary disappearances, specifically presenting the estimated coefficients (β) from Equation (1) using separate samples for male and female missing persons. The treatment group consists of involuntary missing persons without mental illness aged 15–65, while the control group comprises corresponding voluntary missing persons. All specifications include prefecture-by-year fixed effects and prefecture-by-missing-type fixed effects. Standard errors in parentheses are clustered at the provincial level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In contrast, the coefficients for the female sample are close to zero and statistically insignificant. This disparity suggests that the 2015 policy had a substantial impact on the likelihood of males going missing involuntarily, but not on females.

5.2.2 Age Group Analysis

To further examine the heterogeneity across age groups, we estimate Equation (1) separately for males and females in different age groups. The results are presented in Table 4.[19]

Male Sample: Columns (1)–(4) show that, except for males aged 15–20, the coefficients for males aged 21–35, 36–50, and 51–65 are positive and statistically significant for both the number and incidence of missing persons. Specifically:

- **Aged 21–35:** A coefficient of 0.311 for the number of missing persons suggests a 32% increase (0.311/0.986) relative to the sample mean. The corresponding coefficient for incidence is 0.415, representing a 29% increase.
- **Aged 36–50:** A coefficient of 0.159 for the number of missing persons indicates a 58% increase (0.159/0.276) relative to the sample mean, while the incidence coefficient of 0.228 corresponds to a 52% increase.
- **Aged 51–65:** A coefficient of 0.149 for the number of missing persons represents a 133% increase (0.149/0.112), with an incidence coefficient of 0.263 indicating a 93% increase.

The youngest group (aged 15–20) appears less affected, while adult males over 20 show significant impacts from the 2015 policy.

Female Sample: Columns (5)–(8) show that the coefficients across age groups for females are much smaller, with many being statistically insignificant. Notably:

- **Younger Females (15–30):** Female missing persons in this age group are more likely to be associated with bride trafficking, which is unaffected by the 2015 policy. This may explain the statistically insignificant coefficients for this group.
- **Older Females (31–45 and 46–55):** Statistically significant but small coefficients are observed for these age groups, with values of 0.024 and 0.022 for the number of missing persons, respectively. Despite the small magnitudes, these represent substantial relative increases—88% (0.024/0.027) and 200% (0.022/0.011) compared to their low sample means.
- **Incidence of Missing Persons:** A similar trend is seen for the incidence of missing persons. The small coefficients correspond to substantial percentage increases due to the low baseline levels for these groups.

[19] Considering that the factors influencing the disappearances of males and females may differ, we divide the samples into distinct age groups for each gender. For instance, the disappearances of younger females aged 15 – 30 are more likely to be related to bride trafficking.

Given that females constitute only a small proportion of total missing persons, these results suggest a modest rather than substantial impact of the 2015 policy on female missing persons. This observation aligns with clinical evidence indicating that organs from male donors are generally more desirable due to their lower likelihood of rejection in recipients (Gratwohl et al., 2008). Additionally, since the majority of executed prisoners in China were male (Hu, 2000), organs from missing males could have served as perfect substitutes for those previously obtained from executed prisoners after 2015. This context provides a plausible explanation for why the 2015 policy primarily increased the likelihood of missing males potentially related to organ trafficking.

Table 4: DID Estimates of the Effect of the 2015 Policy on Involuntary Missing Persons, by Gender and Age

	Male sample				Female sample			
	15-20	21-35	36-50	51-65	15-30	31-45	46-55	56-65
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Number of missing persons								
$Post2015_t \times Organ_c$	0.047	0.311***	0.159***	0.149***	-0.008	0.024***	0.022**	0.007
	(0.033)	(0.078)	(0.038)	(0.027)	(0.021)	(0.008)	(0.009)	(0.006)
Prefecture FE×Organ FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture FE×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,660	6,660	6,660	6,660	6,660	6,660	6,660	6,660
R^2	0.848	0.952	0.801	0.656	0.680	0.613	0.568	0.582
Mean Dependent Var.	0.301	0.986	0.276	0.112	0.122	0.027	0.011	0.006
Panel B: Incidence of missing persons								
$Post2015_t \times Organ_c$	0.647*	0.415***	0.228***	0.263***	-0.019	0.044***	0.042*	0.005
	(0.352)	(0.108)	(0.060)	(0.069)	(0.051)	(0.016)	(0.024)	(0.027)
Prefecture FE×Organ FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture FE×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,580	6,580	6,580	6,580	6,580	6,580	6,580	6,580
R^2	0.711	0.850	0.680	0.606	0.600	0.573	0.554	0.573
Mean Dependent Var.	1.516	1.426	0.437	0.280	0.213	0.050	0.030	0.024

Notes. This table reports the DID estimates of the 2015 policy's heterogeneous effects on male and female involuntary disappearances in specific age groups, presenting the estimated coefficients (β) from Equation (1). The estimates are based on separate samples for missing males and females by age. For each age group, the treatment group consists of involuntary missing persons without mental illness, while the control group comprises corresponding voluntary missing persons. All specifications include prefecture-by-missing-type fixed effects and prefecture-by-year fixed effects. Standard errors in parentheses are clustered at the provincial level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.2.3 Validating the Common Trends Assumption for the Male Sample

To validate the common trends assumption for the male sample, we estimate Equation (2) for this sample to examine the dynamics of the 2015 policy's effects on male missing persons. The event-study results are presented in Figure A2. Panels (a) and (b) display the OLS and Poisson estimates for the number of missing persons, while Panel (c) presents the OLS estimates for the incidence of missing persons. The results consistently indicate that, prior to 2015, most coefficients are small and statistically insignificant. However, all coefficients increase sharply after 2016, suggesting a significant rise in missing males potentially associated with organ trafficking following the 2015 policy.

These event-study figures align closely with Figure 1, which shows a sharp increase in the number of involuntary missing persons potentially related to organ trafficking after 2016. This raises a pertinent question: why did the number of involuntary missing persons only begin to rise significantly after 2016, despite the policy abolishing the use of prisoner organs having been implemented in 2015?

The reasons for this time lag remain unclear, but two plausible explanations emerge:

Coordination Challenges in Organ Trafficking: Organ trafficking is a high-risk, complex activity that requires extensive coordination among various parties, including traffickers, hospitals, law enforcement, and medical professionals. New entrants into the illicit organ trafficking market would need time to establish their networks, build connections with hospitals, and gain operational experience within the trafficking ecosystem. This initial setup phase, involving the establishment of logistical frameworks and solidifying relationships with key players, could take one to two years. This period of adjustment may help explain the delayed rise in involuntary missing persons following the 2015 policy change.

Delayed Demand for Transplant Organs: While the demand for transplant organs is highly inelastic, it may not be immediately urgent. For instance, patients with end-stage renal disease can survive for an average of 10 years on dialysis while waiting for a matched organ (Wolfe et al., 1999). Consequently, patients may have the capacity to wait for some time before receiving a transplant, particularly following the 2015 policy change, when the supply of organs was adjusting. This relative flexibility in transplant demand may explain the delayed increase in involuntary disappearances after 2015.

5.3 Validity of the Evidence

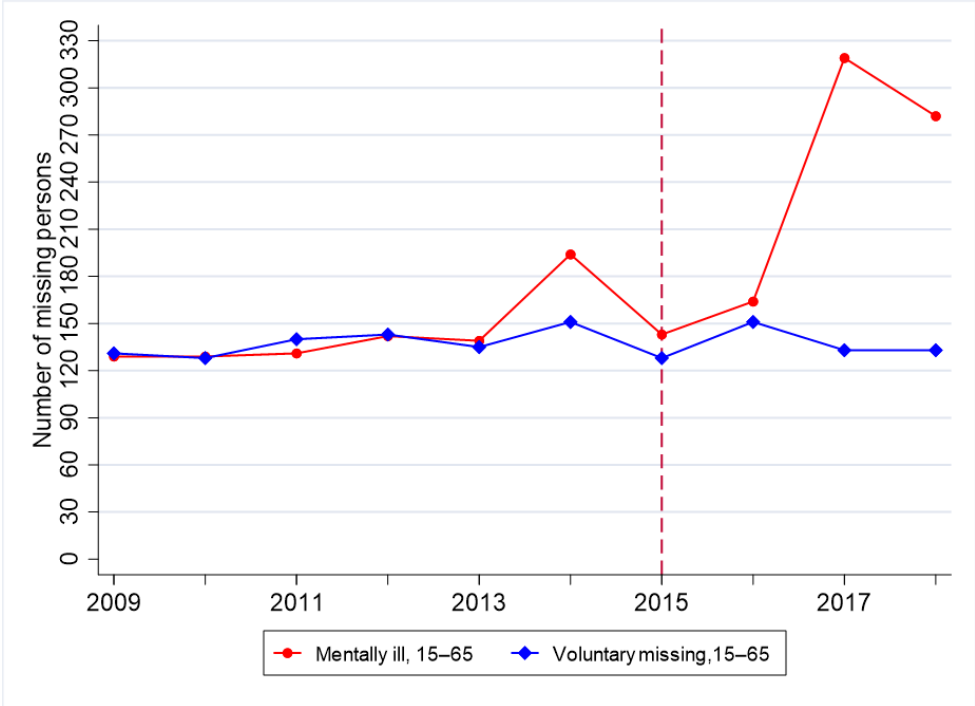
We have demonstrated that involuntary missing persons, potentially related to organ trafficking, increased significantly compared to voluntary missing persons following the 2015 abolition of using prisoner organs. These results strongly suggest that the policy contributed to a substantial rise in organ

trafficking crimes. However, alternative explanations must also be considered. For instance, involuntary missing persons may also be related to other crimes, such as conflict-induced murder and forced labor.

If other policies or unobserved shocks in 2015 heightened social conflict, or if economic shocks after 2015 increased firms' demand for low-cost illegal labor, these factors could also contribute to the rise in involuntary missing persons due to conflict or forced labor. Unfortunately, we cannot identify the exact cause behind each case of involuntary disappearance, limiting our ability to distinguish between trends in missing persons related to organ trafficking and those associated with other crimes.

To address this issue, we focus on missing persons who are less likely to be associated with murder or forced labor but are more susceptible to organ trafficking. As noted earlier, individuals with mental illness are less likely to be targeted for murder or forced labor, but their vulnerability to manipulation makes them particularly susceptible to illegal organ trafficking. In fact, many reported cases of murder for organ harvesting have involved victims with mental illness. For instance, in addition to the 2006 Xingtang case mentioned in Section 2.3, a similar incident occurred in Guizhou Province in 2009, where a beggar with mental illness was targeted.[20]

Figure 3: Trends in Missing Persons Aged 15–65 by Category (Mentally Ill and Voluntary)



Notes. This figure displays trends in the number of missing persons with mental illness (aged 15–65) and voluntary missing persons without mental illness (aged 15–65) from 2009 to 2018.

[20] For detailed information about the case, please visit the website: https://magazine.caixin.com/2009-06-22/100078393.html.

Given this context, we analyze the trends in missing persons with mental illness to infer potential organ trafficking activity following the 2015 policy.

We start by presenting Figure 3, which compares the trends of missing persons with mental illness aged 15–65 to those of voluntary missing persons without mental illness in the same age group. This comparison helps us examine whether the former group experienced a significant increase after 2015. As shown, both groups exhibited similar trends before 2015. However, while the number of voluntary missing persons remained stable after 2016, the number of missing persons with mental illness rose sharply, resulting in a substantial gap between the two groups. This suggests that the 2015 policy may have driven a significant increase in the number of missing persons with mental illness compared to voluntary missing persons, supporting the hypothesis that organ trafficking could be a contributing factor.

To identify this impact, we employ the DID strategy. Using missing persons with mental illness (aged 15–65) as the treatment group and voluntary missing persons without mental illness (aged 15–65) as the control, we estimate Equation (1), with results presented in Table 5.

Table 5: DID Estimates of the Effect of the 2015 Policy on Missing Persons with Mental Illness

Dependent Variable:	Number of missing persons	Incidence of missing persons
	(1)	(2)
$Post2015_t \times Organ_c$	0.255***	0.006**
	(0.087)	(0.002)
Prefecture FE × Organ FE	Yes	Yes
Prefecture FE × Year FE	Yes	Yes
Observations	6,660	6,580
R^2	0.767	0.652
Mean Dependent Var.	0.472	0.013

Notes. This table reports the DID estimates of the 2015 policy's effect on missing persons with mental illness, specifically presenting the estimates of the coefficient β from Equation (1). The sample includes mentally ill missing persons aged 15–65 and voluntary missing persons aged 15–65 without mental illness, with the former as the treatment group and the latter as the control group. All specifications include prefecture-by-year fixed effects and prefecture-by-missing-type fixed effects. Standard errors in parentheses are clustered at the provincial level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

- **Number of Missing Persons:** Column (1) shows a coefficient of 0.255, indicating that each prefecture experienced 0.255 more missing persons with mental illness compared to voluntary missing persons without mental illness after 2015. This corresponds to an approximate 54% increase (0.255/0.472) relative to the sample mean.

- **Incidence of Missing Persons:** Column (2) reports a coefficient of 0.006, suggesting an approximate 46% increase (0.006/0.013) in the incidence of missing persons with mental illness relative to the sample mean.

These findings indicate that the 2015 policy may have significantly increased missing persons with mental illness, potentially related to organ trafficking.

Figure 3 suggests that the common trends assumption likely holds. To further validate this assumption, we estimate a dynamic version of the DID model. Specifically, we estimate Equation (2), with results presented in Figure A2. The results consistently show that, prior to 2015, most coefficients are very small and statistically insignificant. In contrast, after 2016, all coefficients increase sharply, indicating a significant rise in the number of missing persons with mental illness following the 2015 policy. These findings are consistent with the DID estimates and provide further support for the interpretation that the 2015 policy may have driven a substantial increase in missing persons with mental illness.

A natural concern is that individuals with mental illness, due to cognitive impairments, may be inherently more prone to going missing, independent of external factors such as organ trafficking. Indeed, individuals with mental illness are a high-risk group for disappearance, often due to becoming disoriented or being less aware of their surroundings. However, if all cases of missing persons with mental illness were solely due to cognitive impairments, it would be difficult to explain the significant increase in their likelihood of going missing after 2016, as if their cognitive abilities had uniformly declined. A more reasonable inference is that some of these cases may be linked to organ trafficking, especially considering the timing aligns with the significant increase in such cases after 2016. This interpretation is consistent with broader evidence suggesting that the 2015 policy change may have contributed to an increase in organ trafficking-related disappearances.

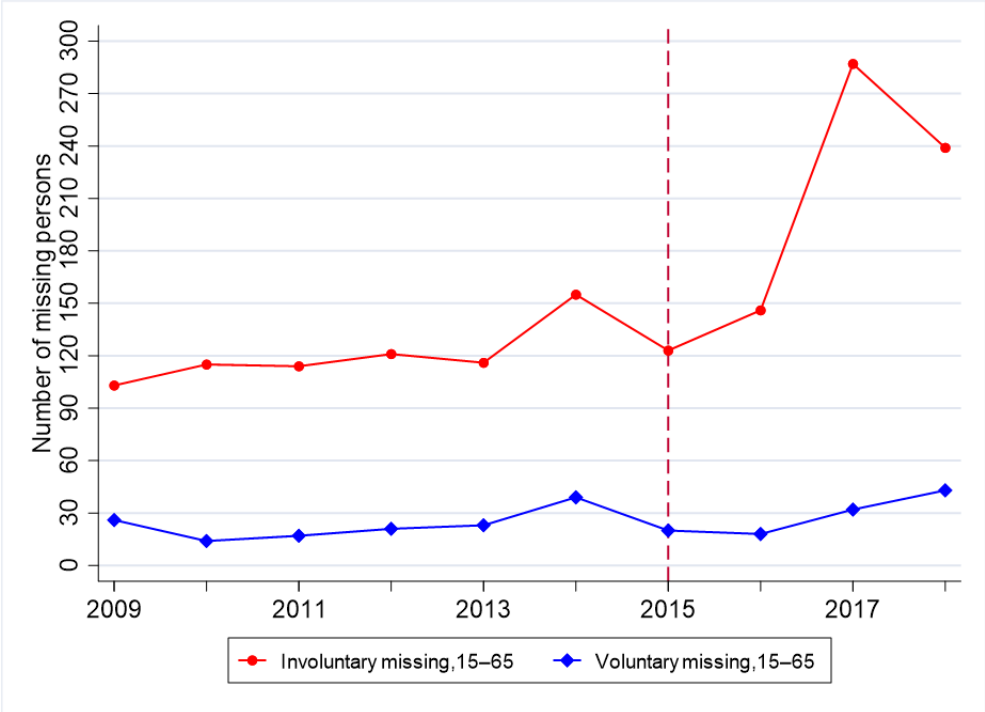
Even within the sample of missing persons with mental illness, involuntary missing cases are more likely to be related to organ trafficking than voluntary cases. To investigate this further, we analyze the descriptive text for each missing person case involving individuals with mental illness. Specifically, we categorize cases into two groups—voluntary and involuntary disappearances—based on the information provided in the descriptions, and then perform a DID analysis within this sample.

As before, a case is labeled as voluntary if the text includes clear indicators of voluntary departure, such as phrases like "ran away" or "left home," which suggest that the individual left home on their own. Conversely, cases lacking such indicators are classified as involuntary disappearances. To ensure the accuracy, we double-check a subset of cases by carefully reviewing their descriptive texts, confirming that the vast majority are correctly classified.

A typical case of voluntary disappearance among individuals with mental illness occurs when the onset of their condition leads them to leave home on their own. While their initial disappearance is unrelated to organ trafficking, there remains a possibility that they could later be abducted by traffickers. However, they are generally less likely to be associated with organ trafficking compared to involuntary missing persons with mental illness. Therefore, in our DID analysis, involuntary and voluntary missing persons with mental illness serve as the treatment and control groups, respectively.

Figure 4 illustrates the trends in both categories. As shown, while the number of voluntary missing persons with mental illness remains stable over time, the number of involuntary cases rises sharply after 2016, resulting in a significant gap between the two groups. These results suggest that the 2015 policy may have contributed to a substantial increase in involuntary missing persons with mental illness relative to voluntary ones.

Figure 4: Trends in Missing Persons with Mental Illness (Voluntary and Involuntary, Aged 15–65)



Notes. This figure displays the trends in the number of involuntary and voluntary missing persons aged 15–65 with mental illness.

Using involuntary missing persons with mental illness as the treatment group and voluntary cases as the control, we estimate Equation (1) and present the results in Table 6. Column (1) reports a coefficient of 0.221 for the number of missing persons, indicating an approximate 83% (0.221/0.266) increase in the number of involuntary missing persons with mental illness relative to the sample mean after 2015. Column (2) presents the corresponding value for the incidence of missing persons as 0.005, reflecting a 71% (0.005/0.007) increase. These results align with previous findings and highlight a

significant effect of the 2015 policy on involuntary disappearances among individuals with mental illness.

Additionally, we estimate Equation (2) and present the event-study figure in Figure A4. The results align with those in Figures A2 and A3, supporting the common trends assumption.

Table 6: DID Estimates of the Effect of the 2015 Policy on Involuntary Missing Persons with Mental Illness

Dependent Variable:	Number of missing persons	Incidence of missing persons
	(1)	(2)
$Post2015_t \times Organ_c$	0.221^{***}	0.005^{***}
	(0.074)	(0.002)
Prefecture FE × Organ FE	Yes	Yes
Prefecture FE ×Year FE	Yes	Yes
Observations	6,660	6,580
R^2	0.773	0.677
Mean Dependent Var.	0.266	0.007

Notes. This table reports the DID estimates of the 2015 policy's effect on involuntary missing persons with mental illness, specifically presenting the estimated coefficients (β) from Equation (1). The sample includes involuntary and voluntary missing persons with mental illness aged 15–65, with the former as the treatment group and the latter as the control group. All specifications include prefecture-by-year fixed effects and prefecture-by-missing-type fixed effects. Standard errors in parentheses are clustered at the provincial level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In summary, this section provides robust evidence that the 2015 abolition of using prisoner organs has significantly increased the number of missing persons with mental illness, particularly involuntary cases that are more likely related to organ trafficking. Since individuals with mental illness are less likely to be associated with other violent crimes, such as murder and forced labor, these findings offer strong evidence that the 2015 policy may have contributed to a substantial rise in organ trafficking.

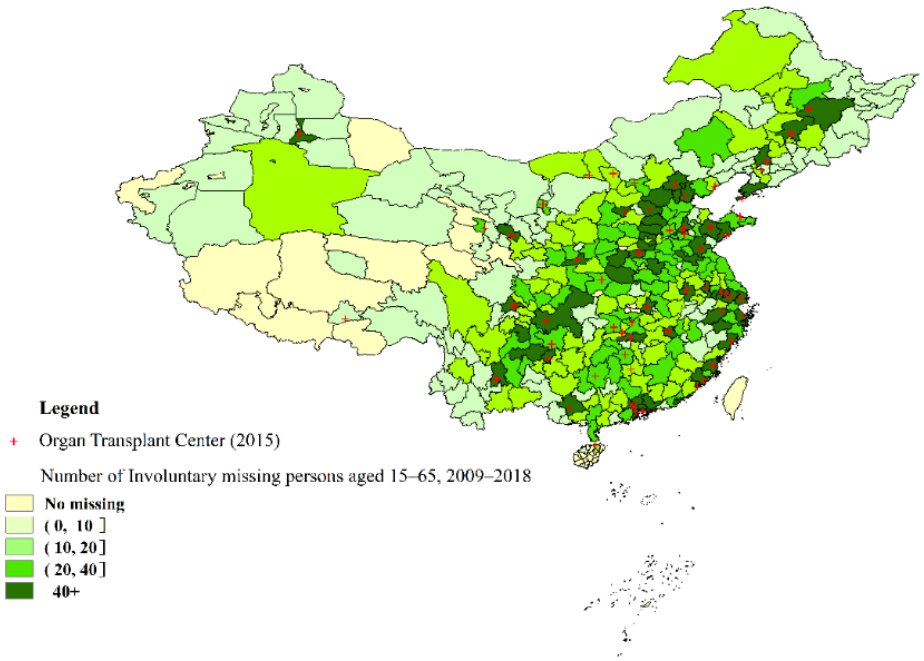
5.4 Triple-Difference Results

As noted previously, organ transplant surgeries generally need to be performed at designated organ transplant centers, making organ trafficking more likely to occur in prefectures with these facilities. This section employs a triple-difference strategy to examine whether prefectures with transplant centers—or those with a greater number of centers—experienced a larger increase in missing persons potentially related to organ trafficking after 2015 compared to prefectures without such centers.

We first analyze the spatial distribution of involuntary missing persons potentially related to organ trafficking across China, examining its correlation with the location of organ transplant centers. Figure 5 reveals that while the number of involuntary missing persons varies significantly across

regions, prefectures with transplant centers generally report higher numbers of involuntary missing persons than those without. This pattern suggests a potential connection between the presence of transplant centers and involuntary disappearances related to organ trafficking.

Figure 5: Spatial Distribution of Involuntary Missing Persons and Its Correlation with Organ Transplant Centers

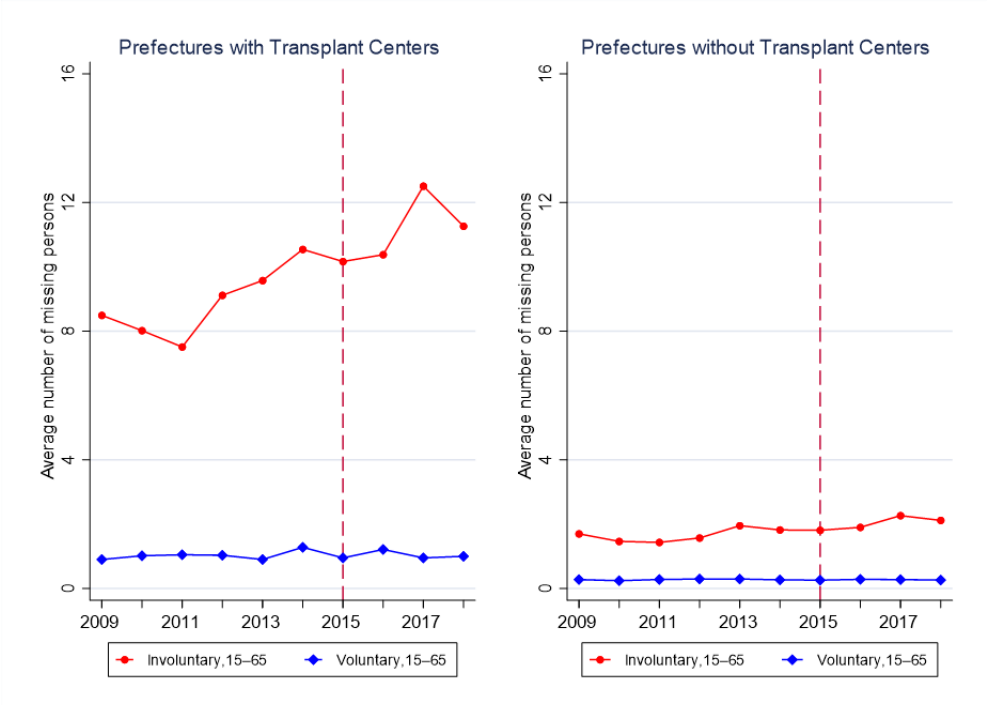


Notes. This map illustrates the spatial distribution of involuntary missing persons aged 15–65 across prefectures in China from 2009 to 2018, highlighting prefectures with organ transplant centers in 2015 using red cross marks. The severity of missing person incidents is categorized in the same way as in Figure 2.

Figure 6 further illustrates the trends in voluntary and involuntary missing persons in prefectures with and without organ transplant centers. In prefectures with transplant centers, the number of voluntary missing persons remains stable over time, while the number of involuntary missing persons rises significantly after 2015. In contrast, prefectures without transplant centers show stable trends for both voluntary and involuntary missing persons. These findings suggest that in prefectures without transplant centers, the 2015 policy change likely had little impact on involuntary missing persons. Conversely, in prefectures with transplant centers, the increase in involuntary missing persons after 2015 may be attributed to a substantial rise in organ trafficking, driven by the policy change.

To quantify the heterogeneous impacts of the 2015 policy on involuntary missing persons across prefectures with and without transplant centers, we employ the triple-difference strategy. Specifically, we introduce two indicators: a binary indicator for the presence of transplant centers $(CenterCity_p)$ and the number of centers $(CenterNum_p)$ in the prefecture. We estimate Equation (3), with results for both indicators presented in Table 7.

Figure 6: Trends in Voluntary and Involuntary Missing Persons in Prefectures with and without Organ Transplant Centers



Notes. This figure shows the trends in the number of voluntary and involuntary missing persons aged 15–65 in prefectures with and without organ transplant centers.

Table 7: Triple-Difference Estimates of the Effect of the 2015 Policy on Involuntary Missing Persons

Dependent Variable	Number of missing persons		Incidence of missing persons	
	(1)	(2)	(3)	(4)
$Post2015_t \times Organ_c \times CenterCity_p$	1.832***		0.200**	
	(0.573)		(0.084)	
$Post2015_t \times Organ_c \times CenterNum_p$		0.702***		0.056***
		(0.082)		(0.012)
Prefecture FE × Organ FE	Yes	Yes	Yes	Yes
Prefecture FE × Year FE	Yes	Yes	Yes	Yes
Organ FE × Year FE	Yes	Yes	Yes	Yes
Observations	6,660	6,660	6,580	6,580
R^2	0.957	0.959	0.905	0.905
Mean Dependent Var.	1.836	1.836	0.483	0.483

Notes. This table reports the triple-difference estimates of the 2015 policy's effect on involuntary missing persons, specifically presenting the estimated coefficients (β) from Equation (3). It examines whether prefectures with transplant centers—or those with a greater number of centers—experienced a larger increase in organ trafficking-related disappearances after 2015 compared to prefectures without such centers. $CenterCity_p$ is an indicator variable that takes a value 1 for prefectures with transplant centers and 0 otherwise; $CenterNum_p$ represents the count of such centers. All specifications include prefecture-by-year fixed effects, prefecture-by-missing-type fixed effects, and missing-type-by-year fixed effects. Standard errors in parentheses are clustered at the provincial level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Column (1) reports a coefficient of 1.832 for the indicator $CenterCity_p$, indicating that prefectures with transplant centers experienced an increase of 1.832, or approximately 100% (1.832/1.836) of the sample mean, in the number of involuntary missing persons relative to voluntary missing persons after 2015, compared to prefectures without these centers. Column (3) presents the corresponding values for the incidence of missing persons as 0.200, reflecting a 41% increase relative to the sample mean. These results suggest that prefectures with transplant centers experienced a significant increase in involuntary missing persons after 2015 compared to those without transplant centers.

Similarly, Column (2) reports a coefficient of 0.702 for the indicator $CenterNum_p$, indicating that an additional transplant center in a prefecture led to an increase of 0.702, or 38% (0.702/1.836) relative to sample mean, in the number of involuntary missing persons compared to voluntary cases after 2015. Column (4) presents the corresponding value for the incidence of missing persons as 0.056, reflecting a 12% increase relative to the sample mean. These results indicate that prefectures with more transplant centers experienced a substantially greater increase in involuntary missing persons after 2015.

In summary, our triple-difference analysis demonstrates that prefectures with transplant centers, particularly those with a higher number of such centers, experienced a sharper increase in involuntary missing persons after 2015 compared to those without or with fewer centers. These findings highly align with our hypothesis that the 2015 abolition of using prisoner organs exacerbated the organ shortage, leading to an increase in organ trafficking-related disappearances, particularly in prefectures with organ transplant centers.

6. Conclusions

Using China's 2015 abolition of organ harvesting from executed prisoners as a natural experiment, we find that the resulting exacerbation of the organ shortage has led to a substantial increase in missing persons potentially related to organ trafficking, particularly in regions with designated organ transplant centers. These findings are both alarming and plausible, highlighting the significant unintended consequences of a well-intentioned policy. The shift from using organs from executed prisoners to sourcing them from the general population underscores an important lesson: even policies with noble intentions can lead to severe and unforeseen outcomes. This unique context highlights the power of market forces, which operate independently of human intentions and interventions.

This study addresses highly sensitive and ethically controversial issue regarding organ trade policies. While most countries strictly prohibit voluntary organ trade for valid ethical concerns, such regulations have further constrained organ supply, significantly exacerbating shortages. These shortages may, in turn, incentivize illegal organ trafficking, including extreme cases such as murder for organ harvesting. While the potential welfare loss associated with allowing voluntary organ transactions is nonnegligible, the social costs of organ trafficking are undoubtedly far greater. Therefore, policymakers designing organ transaction regulations—or similar policies—must consider not only their intended goals but also the broader, unintended consequences, such as induced shortages and their associated harms.

Ultimately, while illegal organ trafficking is profoundly harmful and warrants unequivocal condemnation, the root cause lies in the persistent organ shortage. Addressing this shortage is far more critical than merely focusing on combating the crimes it engenders. Only by alleviating organ scarcity can the underlying issues driving these tragic consequences be resolved. However, achieving this goal remains a great challenge for both scholars and policymakers.

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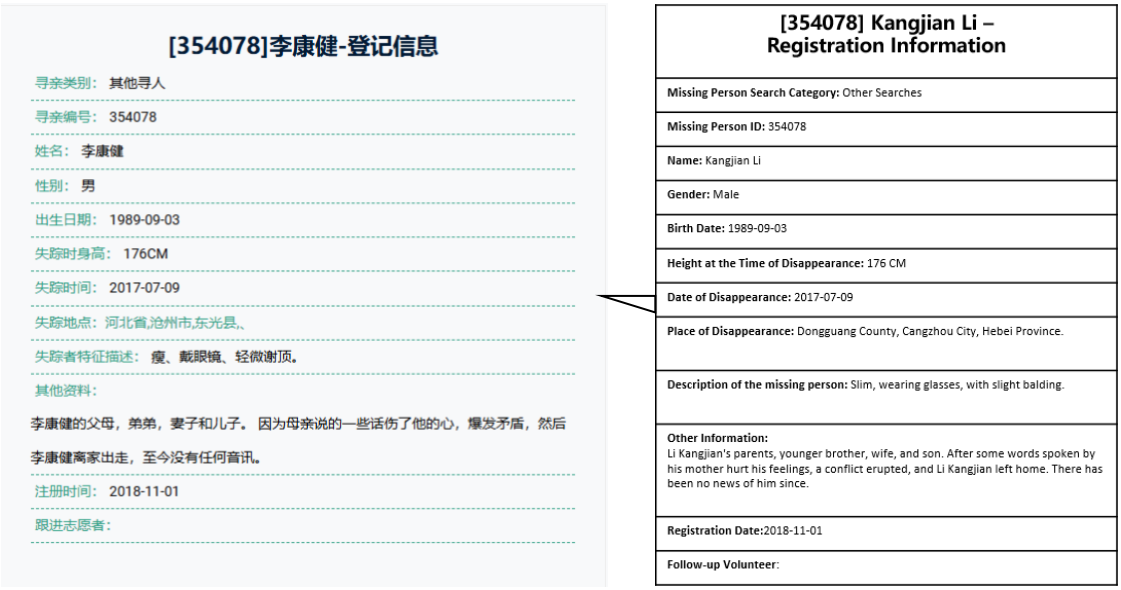
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Appendix

A1. Data

We used Python to scrape all missing person records from the Baby Come Back Home (BCBH) website (https://baobeihuijia.com/bbhj/) up to February 15, 2023. The raw data includes a total of 162,462 records of missing person cases, each record assigned a unique Missing Person ID to prevent duplicate registrations. Figure A1 provides an example of a typical missing person record from BCBH.

Figure A1: An Example of a Typical Missing Person Record from BCBH



[354078]李康健-登记信息

寻亲类别： 其他寻人
寻亲编号： 354078
姓名： 李康健
性别： 男
出生日期： 1989-09-03
失踪时身高： 176CM
失踪时间： 2017-07-09
失踪地点： 河北省,沧州市,东光县、
失踪者特征描述： 瘦、戴眼镜、轻微谢顶。
其他资料：
李康健的父母，弟弟，妻子和儿子。因为母亲说的一些话伤了他的心，爆发矛盾，然后李康健离家出走，至今没有任何音讯。
注册时间： 2018-11-01
跟进志愿者：

[354078] Kangjian Li – Registration Information

Missing Person Search Category: Other Searches
Missing Person ID: 354078
Name: Kangjian Li
Gender: Male
Birth Date: 1989-09-03
Height at the Time of Disappearance: 176 CM
Date of Disappearance: 2017-07-09
Place of Disappearance: Dongguang County, Cangzhou City, Hebei Province.
Description of the missing person: Slim, wearing glasses, with slight balding.
Other Information: Li Kangjian's parents, younger brother, wife, and son. After some words spoken by his mother hurt his feelings, a conflict erupted, and Li Kangjian left home. There has been no news of him since.
Registration Date:2018-11-01
Follow-up Volunteer:

As shown in the figure, each missing person record follows a standardized format with 13 fields: "Missing Person Search Category," "Missing Type," "Missing Person ID," "Name," "Gender," "Birth Date," "Height at the Time of Disappearance," "Date of Disappearance," "Place of Disappearance," "Description of the Missing Person," "Other Information," "Registration Date," and "Follow-up Volunteer."

The "Missing Person Search Category" includes the following categories: "Families Searching for Children," "Children Searching for Their Families," "Helping Martyrs Find Their Hometowns,"[21] "Overseas Search for Relatives,"[22] "Homeless or Begging,"[23] and "Other Searches." Of these, only "Families Searching for Children" and "Children Searching for Their Families" include a "Missing

[21] "Helping Martyrs Find Their Hometowns" is a missing persons category set up by BCBH to assist in finding the hometowns of martyrs who died in war and were buried in foreign lands.
[22] The "Overseas Search for Relatives" category refers to cases where children, who were abandoned and raised abroad, are searching for their biological relatives in China.
[23] The "Homeless or Begging" category refers to cases where passersby report children or homeless individuals begging on the streets to the BCBH platform. These reports are made out of concern that these children may have been trafficked or forced into begging by illegal groups.

Type" field, resulting in a total of 13 fields for these categories, while the others contain only 12 fields. The "Missing Type" includes four categories: "Abduction," "Adoption," "Abandonment," and "Lost," though most records lack this information.

To classify the cause and type of disappearance for each missing person (e.g., whether voluntary or involuntary), we analyze the textual descriptions in the "Other Information" field, as it often contains relevant details not captured in the structured fields.

A2. Data Preprocessing Procedure

To prepare the raw missing person data for analysis, we conduct the following preprocessing steps:

1. Removal of Duplicate Record

Duplicate reports of missing persons were identified using the unique ID assigned to each case, resulting in the removal of 2,135 duplicate record

2. Exclusion of Records Unrelated to the Study

Several categories irrelevant to the study were excluded:

"Overseas Search for Relatives" (9 cases);

"Homeless or Begging" (1,979 cases);

"Helping Martyrs Find Their Hometowns" (4,553 cases);

"Reconnecting with Long-lost Friends" (1,187 cases);

"Abandoned Children" (43,182 cases).

3. Exclusion of Irrelevant or Poor-Quality Records

Records of missing persons already found (1 case marked as "found");

Records flagged for poor data quality (45 cases marked as "uncooperative");

Records with incorrect or incomplete information:

No date of disappearance or birth (8 cases);

No missing place information (1 case);

Date of disappearance earlier than the year of birth (137 cases).

After completing these preprocessing steps, a total of 109,222 missing person records were retained. We further restrict the sample to cases where the year of disappearance falls between 2009 and 2018, yielding a final dataset of 18,336 records for our analysis.

A3. Variable Construction

We use information from the missing person records to construct key variables, such as gender, age at disappearance, time and place of disappearance. Additionally, we analyzed combined textual

information from “Description of Missing Person” and “Other Information” fields to identify the type of disappearance (voluntary or involuntary) and the mental state of the missing person.

Voluntary Disappearance: If the combined text included at least one clear keyword indicating that the individual voluntarily left home, including *“ran away,” “left home,” “hid,” “sneaked away,” “petty matters,” “conflict,” “argued,” “quarreled,” “owed debt,” “acting out of spite,” “family conflict,” “family disagreement,” “family anger... left,” “quarreled... left home,” “conflict... left home,” “conflict... lost contact,” “unsatisfactory... left home,” “ran away from home,” “conflict... ran away,” “angry... left,” “eloped”*—the case was labeled *voluntary*. Otherwise, the case was labeled *involuntary*.

Mental State: Keywords indicating abnormal mental status were used to identify whether the missing individual had a mental illness. These keywords included:

“mental,” “intellectual,” “mental illness,” “neuropathy,” “schizophrenia,” “dementia,” “sluggish,” “intellectual disability,” “Alzheimer's,” “low intelligence,” “mental disability,” “intellectual impairment,” “mental disorder,” “expressive disorder,” “mental disease,” “psychologically abnormal,” “unconscious,” “autism,” “IQ... low,” “having... mental illness...”

The case was labeled *Mental Illness* if such keywords were present, indicating that the individual had a mental illness. Otherwise, it was labeled *Normal*, indicating a normal mental condition.

A subset of the missing person records was manually reviewed to assess both the type of disappearance and the mental health status of the missing individuals. The manual assessments were then compared with the results obtained through the automated keyword-based method. The comparison revealed a consistency of over 90% between the two approaches, validating the reliability of the automated identification process.

A4. The Incidence of Missing Persons

Using the processed missing person data, we calculate the number of missing persons per million population for different types of missing persons across prefectures and years, based on the 2010 and 2015 census data. The steps are outlined below**.**

1. Population Data for Age Groups

To calculate the missing person incidence, we need the total population of individuals aged 15–65, as well as male and female populations, for each prefecture from 2009 to 2018.

Since China’s population census is conducted every five years, exact yearly population data for each prefecture during this period is unavailable. However, assuming a relatively stable population structure, we use the 2010 and 2015 census data to estimate the required population figures for each year.

2. Estimating Populations for 2009–2018

Using the 2010 census data, we calculate populations for age groups such as 16–66, 15–65, 14–64, and so on in 2010. These age groups correspond to the 15–65 age group for different years:

The 16–66 age group in 2010 corresponds to the 15–65 age group in 2009.

The 15–65 age group in 2010 corresponds to the 15–65 age group in 2010.

The 14–64 age group in 2010 corresponds to the 15–65 age group in 2011.

This process continues up to the 7–57 age group in 2010, which corresponds to the 15–65 age group in 2018.

Similarly, the same process was applied to the 2015 census data to estimate populations for 2009–2018.

3. Validation Across Census Years

The population sizes for each age group from the 2010 and 2015 censuses show a strong correlation across regions, with correlation coefficients consistently above 0.9. This high correlation indicates that population structures remained stable during the period, validating the reliability of our estimation method.

The results calculated from the 2010 and 2015 census data were similar, and the main text uses results derived from the 2015 census data.

4. Calculating the Incidence of Missing Persons

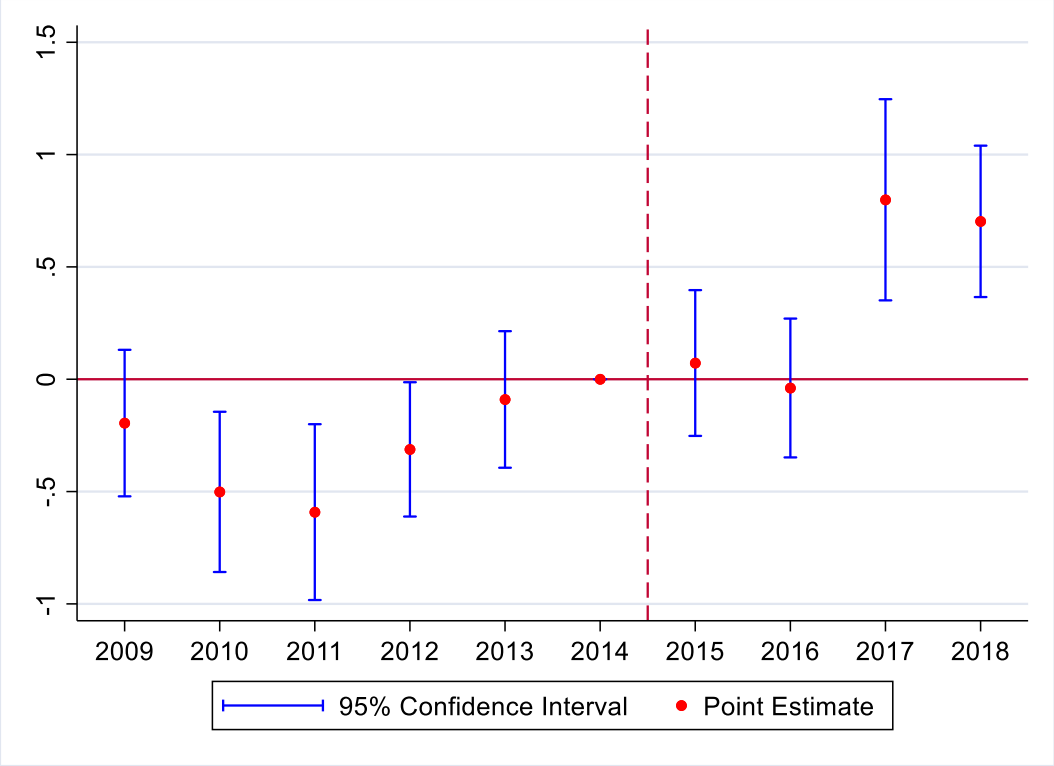
For each prefecture and year, we divide the number of missing persons aged 15–65 by the total population of the same age group for that prefecture and year. This yields the number of missing persons per million people, referred to as the incidence of missing persons.

This approach allows for a consistent and reliable estimation of the incidence of missing persons over time, enabling meaningful comparisons across prefectures and years.

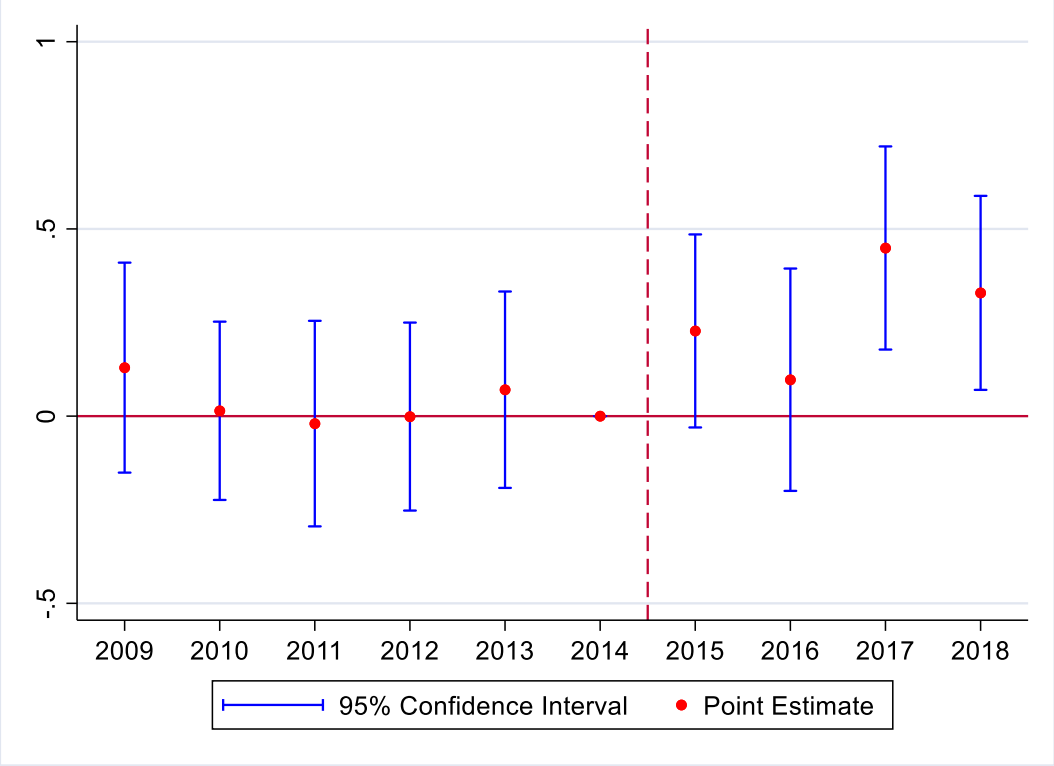
B. Additional Figures and Tables

Figure A2: The Dynamic Effects of the 2015 Policy on Involuntary Male Missing Persons

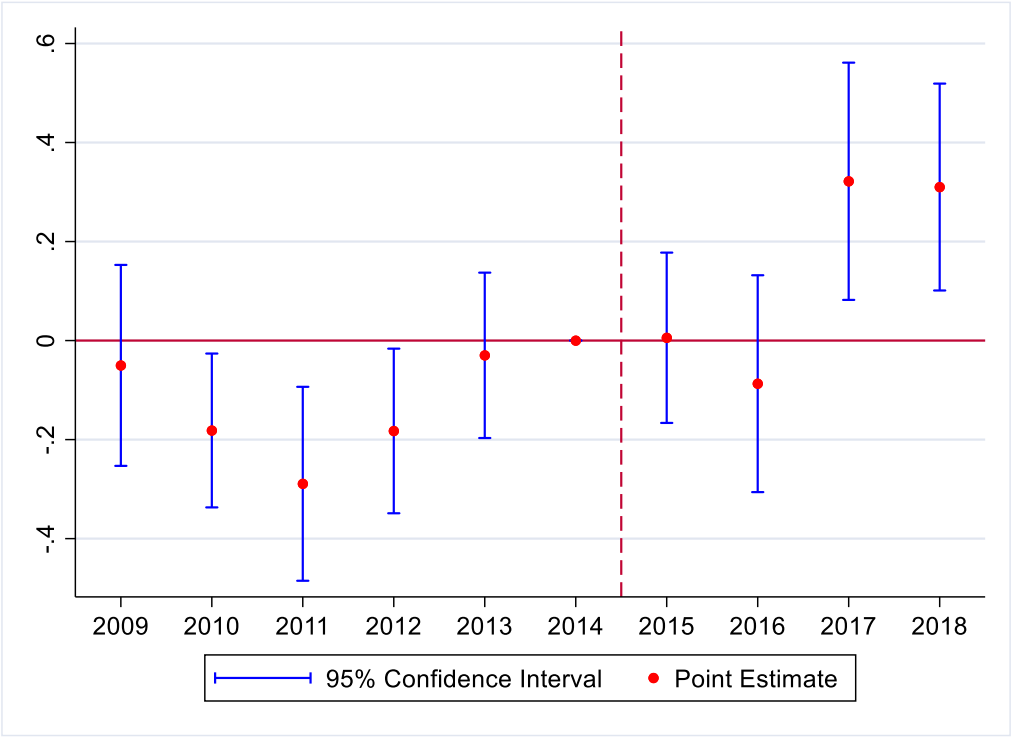
A. OLS (Number of missing persons)



B. Poisson (Number of missing persons)



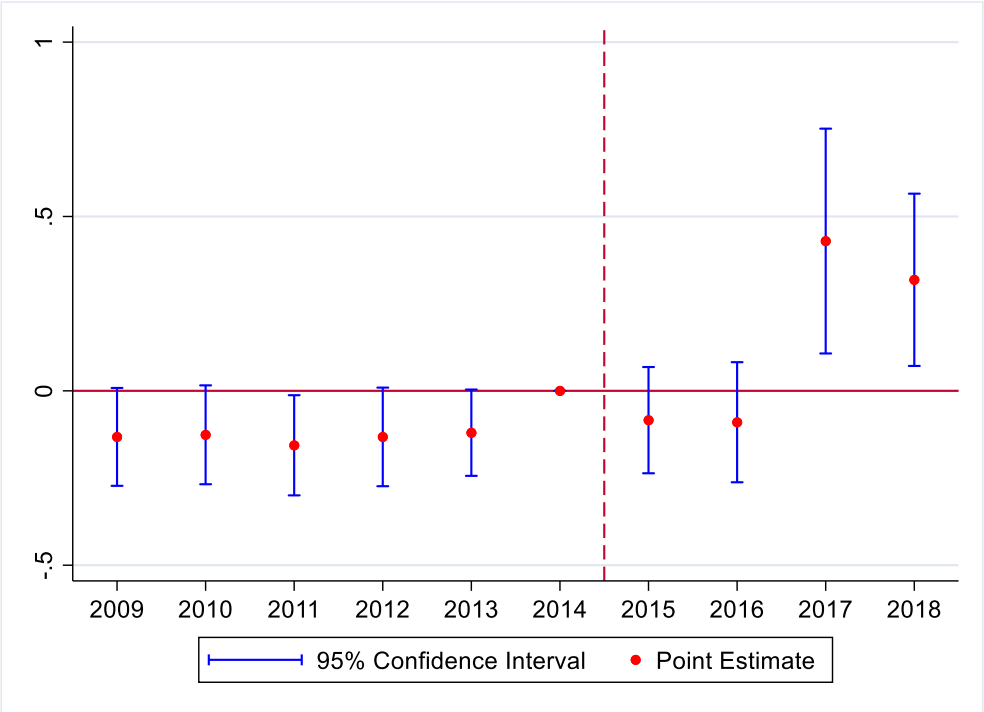
C. OLS (Incidence of missing persons)



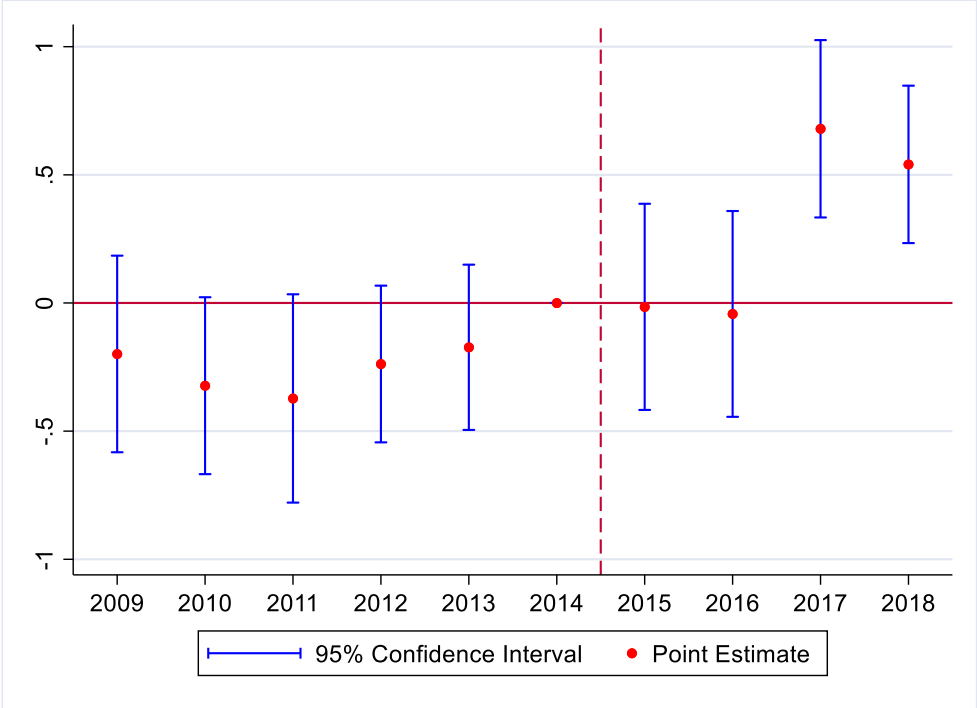
Notes. These figures visualize the dynamic effects of the 2015 policy on involuntary missing persons, presenting the coefficients estimated from Equation (2). The treatment group consists of involuntary missing males aged 15–65, while the control group comprises voluntary missing males of the same age. The reference group is the year 2014, which precedes the 2015 policy. Control variables include the city-by-missing-type fixed effects and city-by-year fixed effects. Panel A and Panel B display the OLS and Poisson results, respectively, with the dependent variable being the number of missing persons. Panel C presents the OLS results when the dependent variable is the incidence of missing persons. The bars represent 95% confidence intervals, and standard errors are clustered at the provincial level.

Figure A3: The Dynamic Effects of the 2015 Policy on Missing Persons with Mental Illness

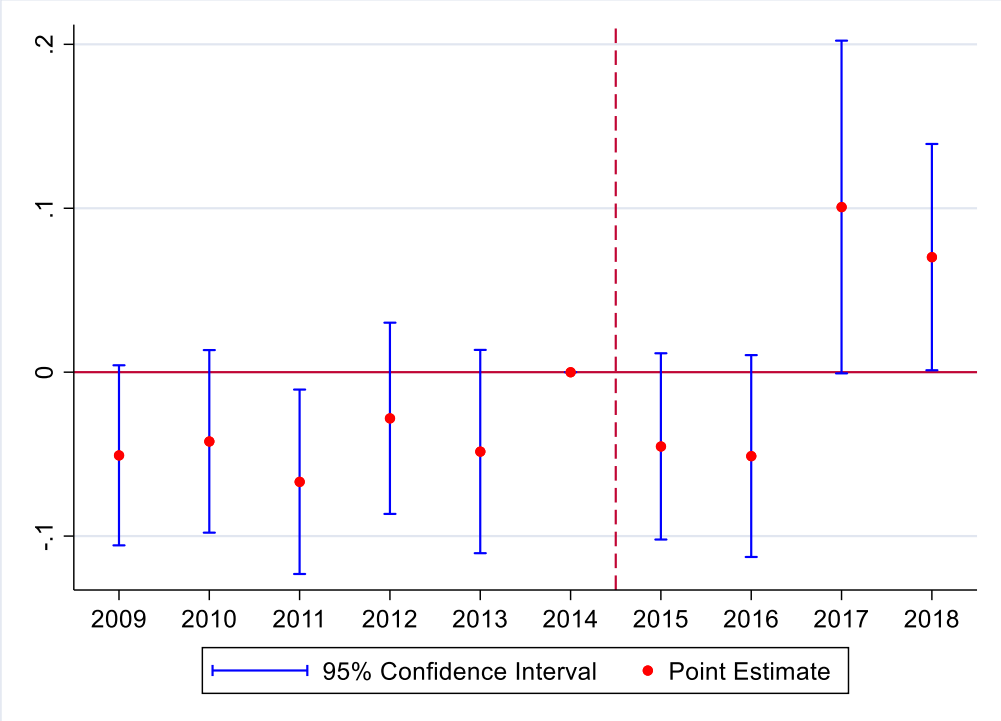
A. OLS (Number of missing persons)



B. Poisson (Number of missing persons)



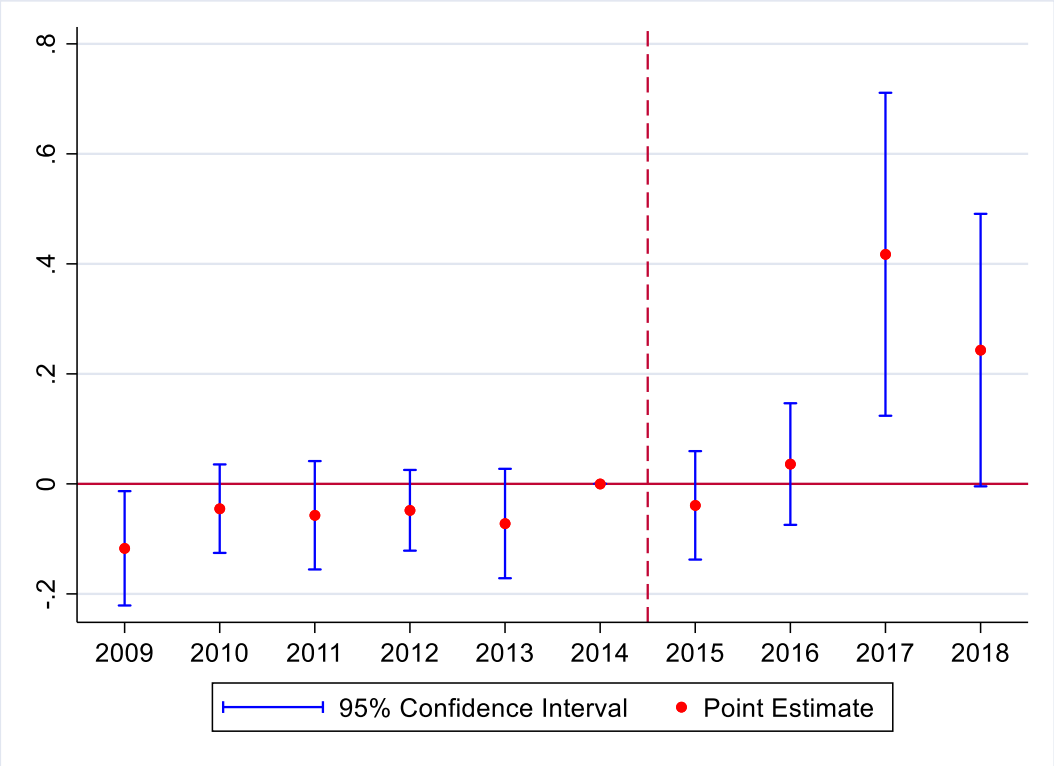
C. OLS (Incidence of missing persons)



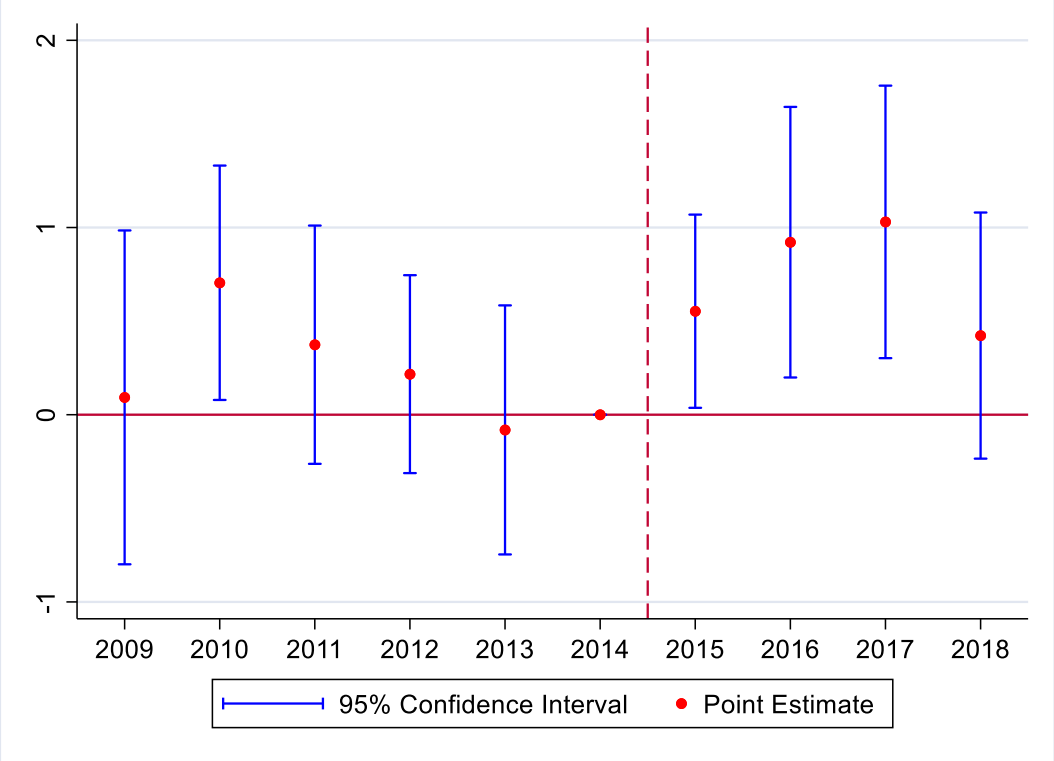
Notes. These figures visualize the dynamic effects of the 2015 policy on involuntary missing persons with mental illness, presenting the coefficients estimated from Equation (2). The treatment group consists of involuntary missing persons with mental illness aged 15–65, while the control group comprises voluntary missing persons of the same age. The reference group is the year 2014, which precedes the 2015 policy. Control variables include the city-by-missing-type fixed effects and city-by-year fixed effects. Panel A and Panel B display the OLS and Poisson results, respectively, with the dependent variable being the number of missing persons. Panel C presents the OLS results when the dependent variable is the incidence of missing persons. The bars represent 95% confidence intervals, and standard errors are clustered at the provincial level.

Figure A4: The Dynamic Effects of the 2015 Policy on Involuntary Missing Persons with Mental Illness

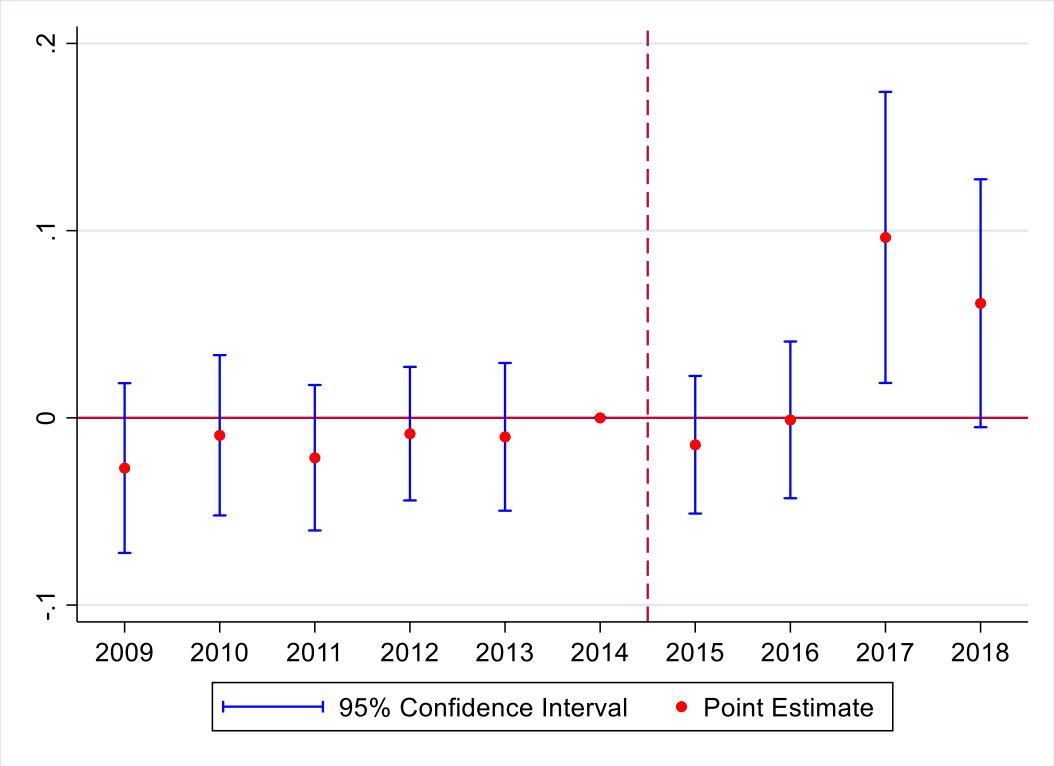
A. OLS (Number of missing persons)



B. Poisson (Number of missing persons)



C. OLS (Incidence of missing persons)



Notes. These figures visualize the dynamic effects of the 2015 policy on missing persons with mental illness, presenting the coefficients estimated from Equation (2). The treatment group consists of involuntary missing persons with mental illness aged 15–65, while the control group comprises voluntary missing persons with mental illness of the same age. The reference group is the year 2014, which precedes the 2015 policy. Control variables include the city-by-missing-type fixed effects and city-by-year fixed effects. Panel A and Panel B display the OLS and Poisson results, respectively, with the dependent variable being the number of missing persons. Panel C presents the OLS results when the dependent variable is the incidence of missing persons. The bars represent 95% confidence intervals, and standard errors are clustered at the provincial level.

Table A1: Poisson Estimates of the Effects of the 2015 Policy on Missing Persons

Dependent Variable:	Number of missing persons				
	(1)	(2)	(3)	(4)	(5)
	Baseline	Male	Female	Mentally ill & Voluntary	Mentally ill
$Post2015_t \times Organ_c$	0.387***	0.400***	0.261	0.842***	0.543***
	(0.047)	(0.049)	(0.165)	(0.182)	(0.125)
Prefecture × Organ FE	Yes	Yes	Yes	Yes	Yes
Prefecture × Year FE	Yes	Yes	Yes	Yes	Yes
Observations	6,660	6,660	6,660	6,660	6,660
Mean Dependent Var.	1.836	1.670	0.166	0.472	0.266

Notes. This table reports the Poisson estimates of the effects of the 2015 policy on missing persons, with the dependent variable being the number of missing persons. It provides robustness checks for all the DID results presented in the main text. Specifically, Column (1) corresponds to Column (2) of Table 2, Column (2) corresponds to Column (1) of Table 3, Column (3) corresponds to Column (1) of Table 3, Column (4) corresponds to Column (2) of Table 5, and Column (5) corresponds to Column (2) of Table 6 in the main text. Standard errors in parentheses are clustered at the provincial level. * p<0.1; ** p<0.05; *** p<0.01.

Table A2: Negative Binomial Estimates of the Effects of the 2015 Policy on Missing Persons

Dependent Variable:	Number of missing persons				
	(1)	(2)	(3)	(4)	(5)
	Baseline	Male	Female	Mentally ill & Voluntary	Mentally ill
$Post2015_t \times Organ_c$	0.378***	0.391***	0.257	0.529***	0.804***
	(0.045)	(0.047)	(0.161)	(0.118)	(0.165)
Prefecture FE × Organ FE	Yes	Yes	Yes	Yes	Yes
Prefecture FE × Year FE	Yes	Yes	Yes	Yes	Yes
Observations	6,660	6,660	6,660	6,660	6,660
Mean Dependent Var.	1.836	1.670	0.166	0.472	0.266

Notes. This table reports the negative binomial estimates of the effects of the 2015 policy on missing persons, with the dependent variable being the number of missing persons. It provides robustness checks for all the DID results presented in the main text. Specifically, Column (1) corresponds to Column (2) of Table 2, Column (2) corresponds to Column (1) of Table 3, Column (3) corresponds to Column (1) of Table 3, Column (4) corresponds to Column (2) of Table 5, and Column (5) corresponds to Column (2) of Table 6 in the main text. Standard errors in parentheses are clustered at the provincial level. * p<0.1; ** p<0.05; *** p<0.01.