The Criminogenic Consequence of Export Slowdown: Evidence from Millions of Court Judgment Documents in China*

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March 17, 2023

Abstract

This paper highlights the criminogenic consequence of the remarkable slowdown in China's export in recent years. Applying a textual analysis to millions of judgment documents at all levels of courts in China, we construct measures of crime rates that vary across cities over time. Estimations using a shift-share instrumental variable find higher crime rates in cities that experience a more severe export slowdown. The effects are more pronounced in regions specializing in manufacturing, which has a larger share of the young and migrant population. Negative export shocks also cause shrinking job opportunities, declining labor earnings, and rising labor disputes. Alternative mechanisms, such as spending on social stability, seem to play a minor role. A back-of-the-envelope calculation based on our baseline estimation suggests that approximately 11.6% of the interquartile difference in crime rates across cities can be explained by the difference in their exposure to the export slowdown.

Keywords: Export slowdown; crime; courts; labor market conditions; shift-share instruments
JEL Code: F10, F14, F16, K42

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1 Introduction

Since the 2008 global financial crisis, global trade growth has been sluggish (World Bank, 2020), raising concerns about insufficient job creation, particularly in the manufacturing sector (Gomis et al., 2020).[1] This study draws evidence from China to highlight a lesser-known socioeconomic consequence of export slowdown: the rising incidence of crimes. China, which has the world's largest working-age population, relies heavily on global demand to maintain growth and generate jobs (Feenstra and Hong, 2010). However, in the past decade, the annual growth of China's exports has more than halved, from an average of 25% during 2001-2008 to less than 5% during 2011-2018. Exploiting the vast variations in crime rates and trade exposure across cities, we provide the first detailed account of the criminogenic consequence of the remarkable slowdown in China's export.

The core of our analysis is based on novel measures of various types of crime constructed from detailed textual analysis of judicial documents. In 2013, China's Supreme People's Court (henceforth SPC) required all judgments from all levels of Chinese courts to be made available to the public, allowing for a precise measure of crime rates across prefecture cities and over time. Furthermore, cities differ in their exposure to export shocks because they have different shares of the manufacturing sector; within manufacturing, they tend to specialize in different products. Therefore, we measure each city's export exposure using a shift-share à la Bartik approach and employ a shift-share instrumental variable (IV) to identify the causal effect. The validity of our approach relies on the construction of foreign shocks that reflect aggregate demand changes in the export destinations but are independent of Chinese firms' export decisions. Specifically, the IV combines product-level shifts in imports from the rest of the world (ROW), excluding China, with the initial export structure of each Chinese city. Following recent studies (Adao et al., 2019; Borusyak et al., 2022; Goldsmith-Pinkham et al., 2020), we implement a battery of validity checks and verify that our findings are not driven by a small number of products or large provinces or by the initial specialization pattern or differential trends in crime rates across cities.

We find robust evidence that China's export slowdown led to rising crime rates. According to our preferred two-stage least squares (2SLS) estimation, a reduction of $1,000 in a city's export per worker is predicted to induce 110 additional criminal cases per million working-age population. The increase in crime rates is sizable, considering that the aver-

[1] According to Aslam et al. (2016), after bouncing back from the low of the Great Recession, the average annual growth rate of global trade is only 3.0% percent since 2012, in contrast to the pre-crisis (1987-2007) average of 7.1%. The World Employment and Social Outlook (Gomis et al., 2020) highlights that the global unemployment rate was at 5.4% in 2019 and is projected to remain at this high level in the coming years. The report also documents that the underlying reduction in employment growth is closely related to a slowdown in global economic activity, especially in the manufacturing sector.

age in our sample is 444 cases per million working-age population. A back-of-the-envelope calculation based on our baseline estimation suggests that approximately 11.6% of the interquartile difference in crime rates across cities could be explained by the difference in their exposure to the export slowdown.[2] As crime has an important externality dimension, our findings call for more policy attention to the socioeconomic consequences of trade-induced shocks.

We also find substantial heterogeneity in the criminal response to adverse export shocks corresponding to city characteristics or types of crime. We estimate cities that rely more on manufacturing production and that have higher proportions of young or migrant population would be more adversely affected by the export slowdown. Regarding the types of crime, we find that the export slowdown has a more pronounced effect on offenses related to resource appropriation, such as robbery, stealing, defraudation, counterfeiting, trademark or intellectual property (henceforth IP) infringement, and criminal activities involving violence, drugs, prostitution, and gambling.

To shed some light on the mechanisms, we estimate the effect of export slowdown on job opportunities and wages. According to Becker (1968) and most recently Britto et al. (2022), shrinking earning opportunities reduce the opportunity cost of committing crimes. Our findings support this insight: we estimate that a $1,000 reduction in exports per worker would lead to 10.5% decline in employment and 10.8% drop in average wage in the manufacturing sector. By contrast, export shocks have a less significant effect on employment and labor earnings in the services sector. In addition, cities with sharper decline in export experience declining inflows and rising outflows of migrant workers. As the export slowdown worsens labor market conditions, potentially increasing conflicts between employees and employers (Kugler and Saint-Paul (2004); Carlsson et al. (2021)), our empirical study provides evidence of numerous labor disputes in more shock-exposed cities. As an alternative channel, sluggish exports lead to reduced governments' spending on public security or surveillance equipment, which in turn induces criminal activities. However, our estimates lend less support to this alternative explanation.

Finally, we show that the empirical findings are consistent with a simple model of trade and occupation choice based on Dinopoulos and Unel (2015) and Bó Dal and Dal Bó (2011). The theory features heterogeneous agents and an endogenous choice of occupation between criminals, workers, and entrepreneurs. Based on their innate ability and the labor market conditions, a household member can choose to become a production worker, a criminal in

[2]Another way to gauge the significance of our estimate is that suppose China had maintained its pre-crisis annual export growth at 20%, the crime rate in Chinese cities would have decreased by 9.5% from its current level.

the appropriation sector, or an entrepreneur. The likelihood of committing crime depends positively on legal sources (i.e., firm profits and wage bills) and negatively on return to manufacturing labor. An adverse export shock not only squeezes the market potential and, consequently, producers' profits but also reduces wages. We show that the latter force dominates when appropriating activity exhibits a strong scale effect, leading to an increasing percentage of criminals. In a broader sense, our model offers a lens through which to examine the impact of trade shocks on workers' occupation choices and the subsequent socioeconomic consequences.

Our study contributes to several strands of literature. First, our study joins the fast-growing literature that estimates the effects of trade shocks on the local labor markets. Following the influential study of Autor et al. (2013), many studies have examined the effects of import competition from low-wage countries, particularly China, on local employment and wages.[3] We join the growing attention on the impact of export shocks on the local economy (Dauth et al., 2014; Feenstra et al., 2019; Erten and Leight, 2021; etc.). We share the rising concern about how the export shocks affect the local economy. Our paper is among the first to examine the rising social tensions, following negative export shocks. A closely related study in this regard is Campante et al. (2019), which documents rising labor strikes in Chinese prefectures because of the export slowdown.

Our study relates to the second strand of literature that connects trade and crime. On the one hand, trade liberalization disincentivizes illegal trade and therefore reduces crime incidents (Prasad, 2012). On the other hand, rising import competition is found to destroy jobs and lower wage earnings, which may induce more crime incidents as the opportunity cost of being a criminal is lowered (Dell et al., 2019; Iyer and Topalova, 2014; Che et al., 2018; Dix-Carneiro et al., 2018).[4] Our focus on rising crime rates in Chinese cities due to shrinking export opportunities has been rarely explored in previous work. We find that export slowdown induces more crime, mainly through weakening local labor market conditions, which is consistent with the Brazilian evidence documented in Dix-Carneiro et al. (2018).

Our study, built on the pioneering Becker-Ehrlich models (Becker, 1968; Ehrlich, 1973), also helps understand the economic motives for engaging in criminal activities. Recent studies have identified shrinking job opportunities and adverse income shocks as the causes of crime (Rose, 2018; Bennett and Ouazad, 2020; Axbard et al., 2021; Britto et al., 2022), while access to credit, public transfer, and relief spending are found to attenuate criminal activities

[3]Related studies include Dix-Carneiro and Kovak (2015), Balsvik et al. (2015), Acemoglu et al. (2016), Feler and Senses (2017), and Dix-Carneiro and Kovak (2017) among others. Autor et al. (2016) provide an excellent survey on the impact of China's import shock.

[4]In addition, Garfinkel et al. (2008, 2015) find that trade liberalization may induce conflicts when the enforcement of property rights is imperfect, and trade intensifies competition for natural resources.

(Khanna et al., 2021; Che et al., 2018; Fishback et al., 2010; Britto et al., 2022).[5] Consistent with these previous findings, we find that the export slowdown shows substantial negative impact on the local economy and labor market outcomes. Furthermore, local governments tend to increase spending on social stability in response to decline in export.

The final contribution of our study is to construct a city level measure of crime rates for various criminal activities. This is not the first study to examine the determinants of crime rates in China. However, previous studies have mainly relied on the province-level published statistics, as reported in the China Law Yearbook. For example, Edlund et al. (2013) uses a province-level panel to study how the sex ratio imbalance led to high incidence of violence and property crime in China between 1988 and 2004. Li et al. (2019) explores the relationship between income inequality and criminal prosecution rates. These official statistics may be underreported (He and Marshall, 1997; Yu and Zhang, 1999; Dong et al., 2020) and do not distinguish between specific types of crime. By contrast, our crime statistics are directly derived from the court judgment documents, which are legally published and publicly accessible. Specifically, we adopt a new textual analysis approach to analyze the effective judgments, verdicts, and conciliation agreements at all levels of Chinese courts, which help measure the crime rate for each Chinese city and by fourteen types of criminal activities.[6] With this new set of crime measurements, we offer further explanations for the rising crime rates across Chinese cities based on those cities' exposure to the recent export slowdown.

The rest of the paper is organized as follows. Section 2 describes the various data sources and statistical measures used in our analysis. Section 3 introduces the empirical strategy. Section 4 presents the main empirical findings. Section 5 discusses possible mechanisms. Section 6 lays out a model linking export shocks and criminal activities. Section 7 concludes the paper.

2 Data Sources and Measures

We describe our data sources and main variables, including the measures of crime rates and export shocks. Variables used in mechanism analysis are discussed in section 5. Further details on the data construction are described in Appendix C. Throughout our study, we focus on prefecture cities as the geographical unit.[7] Our sample includes 326 prefectures

[5]However, Bennett and Ouazad (2020) and Bhalotra et al. (2021) find that public transfers, such as unemployment benefits, do not necessarily offset the negative impact of income loss on crime.

[6]Dong et al. (2020) use the judgments documents from 2014 to 2016 to study the impact of poverty and inequality on homicide rates in China. In comparison, we identify the causal effect of export shocks on crime. In addition, our study covers all types of crime in a longer period.

[7]A four-layer hierarchy system governs the geographical administrative units in China. The country is first categorized into provincial units, including provinces (e.g., Jiangsu Province), autonomous regions (e.g.,

covering 31 provinces in mainland China, with a median working-age population (15-64 year old) of 2.35 million in 2010 and a median land area of 12,877km^2.

2.1 Measuring Crime Rates

Our crime data are obtained from the China Judgments Online Database (CJO), the official website of the SPC of China. As an important part of a judicial reform aiming to increase legal transparency, the SPC mandates that people's courts at all levels to disclose their judicial documents on an online platform.[8] The CJO database, therefore, covers almost all types of judgment documents during 2011 and 2018, except for some special cases such as the ones involving national security, juvenile delinquency, divorce litigation, and cases that are closed through mediation.[9] The CJO database includes five main types: criminal, civil, administrative judgments, enforcement rulings, and other judicial documents (such as payment orders, state compensation decisions and mediation documents). Each judgment document consists of the case date, title, court location, and a detailed description of the event. In this study, we focus on criminal cases that violate the Criminal Law of the People's Republic of China as criminal activities result in high social costs (Loayza et al., 2000).[10] Combating crime and maintaining social stability are always an important issue for China's central and local governments. We use all first-instance criminal cases sentenced by all levels of courts in a city to compute the city-level crime rate as most criminal cases are heard and sentenced by county-level primary courts or city-level intermediate courts.[11] In addition, we

Tibet), and municipalities directly under the central government (e.g., Beijing, Shanghai, Chongqing, and Tianjin). Prefecture-level divisions are the second level of the administrative structure. Large prefectures are subdivided into (autonomous) counties and county-level cities. Finally, townships or towns are at the fourth level of the administrative structure. In this study, the unit of analysis is the prefecture city. Our analysis includes the four municipalities (Beijing, Shanghai, Chongqing, and Tianjin) in our analysis and provides robustness checks without these super large cities. For details, see http://xzqh.mca.gov.cn/statistics/2018.html.

[8] People's courts are the judicial organs of China responsible for case trials and dispute settlement. Courts in China are institutionalized at four levels. There are over 3000 county-level primary courts, over 400 city-level intermediate courts, 31 province-level high courts, and one supreme court. Each level of courts can be the first-instance court but deals with different kinds of criminal cases. Higher people's courts have the right and duty to supervise the work of lower people's courts. For more detailed information on China's legal system, see Appendix B.

[9] The CJO was established on November 13 2013. Detailed information about judgement documents covered by the CJO can be found in Appendix C. Also see the official website at https://wenshu.court.gov.cn/.

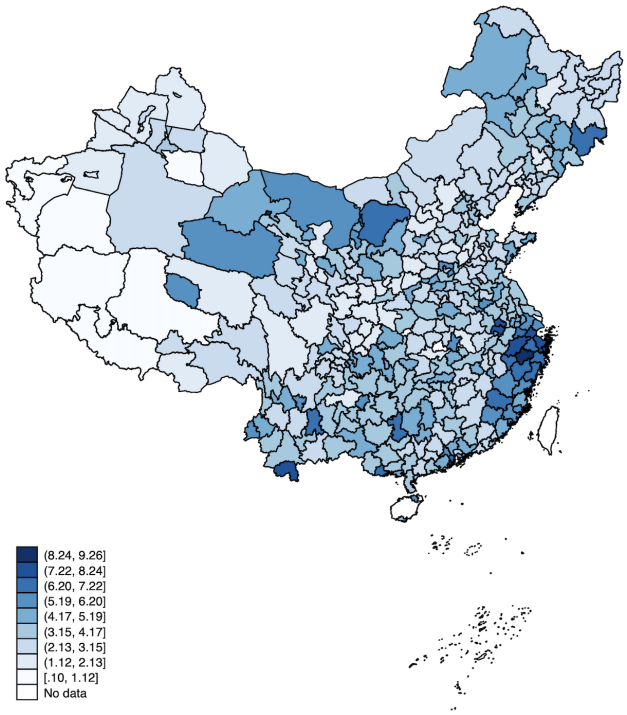
[10] According to Miller et al. (1993) and Levitt (2002), crime costs victims $200 billion per year in the United States, while the cost of reducing it is equally large. In Latin America, the estimated social costs of crime amount to $168 billion, or 14.2 percent of the region's GDP (Loayza et al., 2000). As for China, the rapid growth of criminal activities in recent years has attracted a lot of attention (Edlund et al., 2013; Cameron et al., 2019).

[11] Criminal cases closed by the province-level high courts and the SPC only account for 0.01% (223/4,249,699) in our sample.

exclude cases with missing information on the prosecution year and court location.

Variable construction: We conduct a textual analysis of the case description transcripts to assign each case in our data to a type of crime. Specifically, we search each judgment document for keywords related to a certain type of crime. For example, a case is classified as "Robbery" if it contains Chinese keywords of "抢劫", "抢夺" or "哄抢", whose English meanings are robbery. For cases involving several types of criminal activities, we assign them to multiple categories. For instance, if a criminal committed both robbery and homicide simultaneously, we assign this case to both "Robbery" and "Violence". Appendix Table A.1 summarizes the keywords associated to the 14 types of crime studied in this paper. Further, we aggregate the individual-level data to obtain the total number of crime incidents by year and city and by crime type. We standardize the number of criminal cases by the working-age population of each city in 2010, based on the 2010 Population Census, to measure crime rates because cities differ greatly in size. Thus, our dependent variable measures the number of criminal cases per thousand working-age residents.

Figure 1: Geographic Distribution of Court Recorded Crime



Notes: The figure displays the distribution of crime rates, measured by the number of criminal cases per thousand working-age population, between 2011 and 2018 across China. We construct crime rates using micro-data from China Judgments Online.

Table 1 shows the summary statistics, where we report the mean and the standard deviation (in parentheses) of city-level crime rates by region (i.e., East, Middle, and West China) and three time bins from 2011 to 2018, with the last column applying to all sample

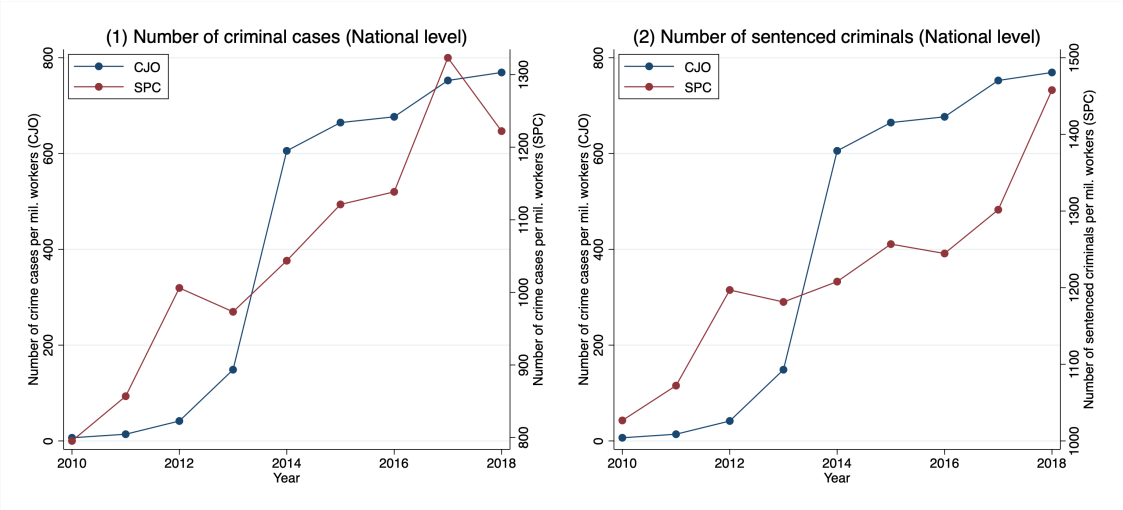
Table 1: Summary Statistics for Crime Measures

Variables: Crime Rates	Region	2011-2013	2014-2016	2017-2018	All Year
Number of total criminal cases per thou. workers	East	0.081	0.713	0.774	0.492
		(0.183)	(0.338)	(0.282)	(0.420)
	Middle	0.039	0.586	0.773	0.428
		(0.093)	(0.221)	(0.255)	(0.366)
	West	0.046	0.598	0.304	0.418
		(0.111)	(0.304)	(0.343)	(0.391)
Number of criminal cases related to public security and the safety of individuals and property per thou. workers	East	0.064	0.532	0.572	0.366
		(0.148)	(0.260)	(0.210)	(0.316)
	Middle	0.030	0.442	0.583	0.323
		(0.073)	(0.170)	(0.198)	(0.278)
	West	0.032	0.436	0.516	0.304
		(0.073)	(0.226)	(0.261)	(0.289)
Number of criminal cases related to drugs, prostitution and gambling per thou. workers	East	0.009	0.111	0.094	0.069
		(0.026)	(0.112)	(0.074)	(0.092)
	Middle	0.004	0.069	0.080	0.047
		(0.013)	(0.058)	(0.061)	(0.058)
	West	0.007	0.097	0.100	0.064
		(0.023)	(0.095)	(0.094)	(0.088)
Number of criminal cases related to disrupting the order of the socialist market economy per thous. workers	East	0.004	0.029	0.027	0.019
		(0.008)	(0.015)	(0.015)	(0.017)
	Middle	0.002	0.027	0.027	0.018
		(0.006)	(0.016)	(0.012)	(0.017)
	West	0.002	0.019	0.019	0.012
		(0.004)	(0.010)	(0.011)	(0.012)

Notes: The table reports the summary statistics of crime rates by year, region and major types of crime. Crime rate is measured as the number of criminal cases per thousand workers. The mean across cities and every year bin is reported, with the standard deviation in parentheses. The "All Years" column reports the summary statistics where we pool all data together. Provinces are classified into three regions: (i) East (including Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan), (ii) Middle (including Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan) and (iii) West (including Sichuan, Chongqing, Guizhou, Yunnan, Xizang, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Guangxi, Inner Mongolia). For space-saving, we divide the criminal cases into three main categories: (i) crime related to public security and the safety of individuals and property (which include public security, traffic, violence, robbery, stealing, defraudation, extortion cases); (ii) crime related to drugs, prostitution and gambling; (iii) crime related to disrupting the order of the socialist market economy (which include fake-product, IP infringements, finance, bribery cases). Criminal cases related to public security and the safety of individuals and property account for the largest proportion in our sample (about 70%). In the following heterogeneity analysis, we further divide the criminal cases into 14 categories.

years. Overall, the eastern region has higher crime rates than western and middle China. The middle region sees the biggest increase in crime rates, with the average crime rate increasing from 0.04 (2011-2013) to 0.77 (2017-2018). Figure 1 illustrates the spatial variations in crime rates across cities. The Yangtze River Delta, the southeast coastal areas, and a few western cities in Inner Mongolia and Qinghai have higher crime rates.

Figure 2: Compare crime recorded on CJO versus SPC



Notes: The figure compares national crime rates computed from the CJO database and the annual work reports given by SPC at the National People's Congress, respectively. Our crime rates are measured by the number of criminal cases per million working-age population. In the top figure, we compare CJO-based crime rates to the SPC crime rates (measured by the number of concluded criminal cases of the first instance per million workers). The bottom figure compares CJO-based crime rates with that reported by the annual work report (measured by the number of sentenced criminals per million workers).

Data representativeness: Despite their broad geographic coverage, there are concerns about the representativeness of our measurements of crime rates, such as the variations in the crime rates over time can be driven by the courts' increasing tendency to disclose judgment documents, rather than capturing the actual increase in criminal activities. As shown in Table 1, the number of criminal cases sharply increased in the 2014-2016 sample. This is because the CJO was not established until the end of 2013; therefore, not all judgments before 2014 were posted online. However, this gap is not likely to drive our estimates. First, our results are robust when we use a sample that excludes the early period from 2011 to 2013. Furthermore, we calculate crime rates using alternative measures directly from the official statistics, which is only available at the provincial or national level. In particular, Figure 2 compares the crime rates calculated from the CJO data with two alternative official statistics sourced from the SPC annual reports, with all measures aggregated at the national level. Panel (1) of Figure 2 presents a comparison of the calculated national crime rate with the number of concluded first-instance criminal cases, while panel (2) presents a comparison with the number of sentenced criminals. The three series evolve closely. Notably, the calculated

crime rates are lower than those from the SPC annual reports in the early years, reflecting the possible underreporting of criminal cases in these years. Importantly, the discrepancy in crime rates based on the CJO data and the official statistics is unlikely to correlate with the local economic conditions, including export shocks, our interested variable.[12]

2.2 Measuring Export Slowdown

Data on exports by product and city are taken from the China Customs Database (2010-2018) collected by China's General Administration of Customs. The database covers the universe of Chinese import and export transactions. For each transaction, it provides detailed information on trade values (in US dollars) at the eight-digit Harmonized System (HS) product level (over 7000 products), trade partners (i.e., destination markets and source countries), and the location (city) of the Chinese importers and exporters. To measure a city's exposure to a global trade slowdown, we follow Campante et al. (2019) and define $ExpShock_{ct}$ as the annual change in the city-level exports, standardized by the city's working-age population in 2010, the beginning of our sample period:

$$ExpShock_{ct} = \frac{Export_{ct} - Export_{ct-1}}{L_{c,2010}}, \tag{1}$$

where $Export_{ct} = \Sigma_k \Sigma_{f \in c} X_{fckt}$ is the total export value (in 1000 USD) of product k produced by firm f in city c and year t; $L_{c,2010}$ denotes the working-age population of city c in 2010, based on the 2010 China Population Census. As we focus on manufacturing exports, we concord each eight-digit HS product code to the Standard Industrial Classification (SIC) at the 4-digit level, and only retain manufacturing products whose leading digit in the SIC codes is equal to 2 or 3.[13]

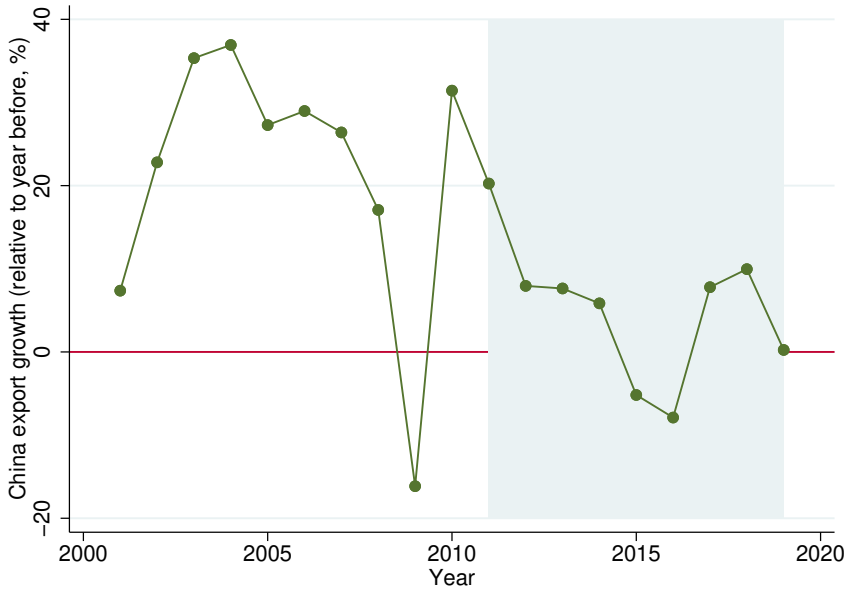
Figure 3 plots the annual growth rates of China's manufacturing exports from 2001 to 2019. China's exports grew rapidly after its accession into the WTO in 2001, with an average annual rate of 25% between 2001 and 2008. However, the 2008-2009 global financial crisis put an end to the extraordinary growth path. Since 2011, China's export growth has declined from nearly 20% in 2011 to only 0.2% in 2019, with significantly negative growth rates in both 2015 and 2016.[14] To avoid the confounding factors owing to the China-US trade war and the pandemic, our empirical analysis focuses on the period up to 2018.

[12] Appendix Figure A.1 (panel (1)) compares our constructed crime rates based on the CJO data with the number of criminal suspects under public prosecution. The data on criminal suspects is from the China Procuratorial Yearbooks and is available at the provincial level, so panel (2) of Figure A.1 compares the changes in the provincial crime rates constructed from both sources, again showing very similar patterns.

[13] The concordance between HS code and SIC product classification is provided by the World Integrated Trade Solutions (WITS) at: https://wits.worldbank.org/product_concordance.html.

[14] Throughout the whole period between 2011 and 2019, China only managed to maintain an average annual growth rate at 5%.

Figure 3: Manufacturing Export Growth of China



Notes: The figure plots China's manufacturing exports growth rate between 2001 and 2019. The growth rate is computed as the annual changes in China's manufacturing exports to the rest of the world relative to the previous year. Exports data comes from China's General Administration of Customs.

Appendix Table A.2 reports the summary statistics of the variables used in our empirical analysis. Variables in panel A are used in the baseline regressions in Section 4, while variables in panel B are used in the mechanism analysis in section 5.

3 Empirical Strategy

We now describe our regression specification and the IV strategy adopted to identify the effects of export slowdown on the incidents of crime.

3.1 Baseline Specifications

We regress the city-level crime rate on the export shock experienced by the city, using the following baseline specification:

$$(Crime/L)_{ct} = \beta_1 ExpShock_{ct} + \beta_2 X_{ct} + \gamma_t + \gamma_c + \epsilon_{ct} \tag{2}$$

where $(Crime/L)_{ct}$ is the number of criminal incidents per thousand working-age population in city c in year t. The explanatory variable of interest ($ExpShock_{ct}$), defined in equation (1), denotes the change in exports per worker of city c in year t. X_{ct} is a vector of additional controls for other city-year-level economic or demographic factors that may affect crime rates. We also control for the year fixed effects (γ_t) to account for any macro shocks or business

cycles, and the city fixed effects (γ_c) for any time-invariant city-specific characteristics that may affect the crime rate. We cluster the standard errors at the city level to account for the possible correlation within cities and across years. Our baseline estimators cover 326 cities from 2011 to 2018.

3.2 Instrument Variable

Directly estimating equation (2) using the ordinary least square (OLS) method may be problematic. First, there may be reverse causality in that higher crime rates may discourage investment and production, leading to negative export performance. Second, there could also be an omitted variable bias such that other unobserved shocks across cities and years may simultaneously affect exports and crime incidence.

To address such endogeneity, we follow Campante et al. (2019) and employ a shift share à la Bartik IV approach that does not rely on the local export performance but rather on the changes in total world trade flows excluding China (i.e., import demand from the ROW). Specifically, we use as IV the product-level changes in exports from the ROW to the ROW, excluding China, which are weighted by the initial export shares of each city.[15] Similar IVs have also been used by Autor et al. (2013) and Khanna et al. (2020). Specifically, the IV is constructed as

$$ExpShock_{ct}^{ROW} = \Sigma_k \frac{X_{ck,2010}}{\Sigma_c X_{ck,2010}} \frac{\Delta X_{kt}^{ROW}}{L_{c,2010}}, \tag{3}$$

where $L_{c,2010}$ is the working-age population in city c in 2010; $\Delta X_{kt}^{ROW} = X_{kt}^{ROW} - X_{kt-1}^{ROW}$ denotes the change in exports of each six-digit HS product k from the ROW to the ROW between t and $t-1$, reflecting changes in foreign demand. $\frac{X_{ck,2010}}{\Sigma_c X_{ck,2010}}$ denotes the start-of-period product export share, calculated by dividing exports of product k from city c (i.e., $X_{ck,2010}$) by product k's national exports (i.e., $\Sigma_c X_{ck,2010}$). In short, cities with a higher share of products experiencing a larger export slowdown would be adversely affected more than other cities.

The exogeneity of our IV relies on the assumptions that, conditional on the year- and city-fixed effects, other unobserved time-varying city-specific determinants of the outcome variable in the error term are uncorrelated with: (1) the product-specific foreign demand shocks observed at the national level and (2) the initial city-product-specific export structure. Regarding the first condition, the shifts in the ROW trade shocks (ΔX_{kt}^{ROW}) capture the foreign demand shocks external to China. Aslam et al. (2016), for example, provides evidence that three-fourths of the slowdown in global import growth after 2012 can be attributed to the weakness in domestic absorption and overall economic environments. Therefore,

[15] Data on world trade flows is from the UN comtrade database, which includes detailed bilateral trade flow for each six-digit HS product code.

the variations in the shifts of the Bartik IV are mainly driven by the changes in foreign demand conditions and are less likely affected by changes in the local economic conditions. Furthermore, we run a battery of robustness checks (also in Section 4), showing that our estimates are robust to (1) controlling for measures of city-level shocks to domestic demand, supply, and imports and (2) the balance test as suggested by Borusyak et al. (2022), which indicates that the shifts are as good as randomly assigned to Chinese cities.

The second condition can be violated if the occurrence of criminal cases is correlated with the local initial export structure. Adding the city fixed effects (γ_c) partially eliminates this concern, as it is intended to account for any time-invariant city-specific characteristics in the outcome variable that could be correlated to the initial export structure (McCaig, 2011; Li, 2018; Campante et al., 2019; Xu, 2020). Furthermore, we show that our estimates do not suffer from the pre-trend and pass other statistical tests suggested by Goldsmith-Pinkham et al. (2020) and Borusyak et al. (2022), which we discuss in more detail in Section 4.3.

4 Empirical Results

We now discuss our main empirical findings on the impact of the 2011-2018 export slowdown on crime rates in Chinese cities. We begin by presenting the baseline specification, followed by heterogeneity analyses. We then discuss the robustness of our findings and present validity checks for the Bartik IV.

4.1 Baseline Results

Table 2 presents our baseline results based on equation (2). The first column shows the OLS estimation, while column (2) shows the 2SLS estimation using the Bartik IV. Columns (3)-(4) add additional controls and the province-year-specific trends. We then directly regress the crime rate on the instrument in columns (5)-(7).

The OLS result in column (1) shows that an export slowdown (i.e., a drop in $ExpShock_{ct}$) leads to an increased crime rate, measured as the number of criminal cases per thousand workers. The IV estimation in column (2) confirms a considerable effect of the export slowdown. The OLS result underestimates the impact of the export slowdown, suggesting that some uncontrolled factors in the error term are positively correlated with $ExpShock_{ct}$ and hence dampens the magnitude of β_1 in the OLS estimation. This result is probably due to a measurement error in $ExpShock_{ct}$, or an omitted variable bias. For example, an unobserved productivity shock or automation may promote exports while increasing crime rate by displacing workers, omitting which will dampen the coefficient estimate for β_1. A domestic demand boom in the error term may also have reduced both exports and crime

Table 2: Baseline Results

Dep. Var.:	Criminal cases per thousand$_{ct}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	IV	IV	IV	OLS-RF	OLS-RF	OLS-RF
ExpShock$_{ct}$	-0.022**	-0.110***	-0.106***	-0.052**			
	(0.011)	(0.027)	(0.027)	(0.022)			
ExpShock$_{ct}^{ROW}$					-0.019***	-0.018***	-0.010**
					(0.004)	(0.004)	(0.004)
$\triangle$Log GDPpc$_{ct}$			0.147**	0.163*		0.137*	0.149*
			(0.074)	(0.086)		(0.072)	(0.084)
$\triangle$Log Population$_{ct}$			0.016	-0.060		-0.000	-0.064
			(0.155)	(0.126)		(0.140)	(0.126)
$\triangle$Log FDI$_{ct}$			0.001	0.004		0.001	0.004
			(0.003)	(0.003)		(0.003)	(0.003)
$\triangle$College share$_{ct}$			-0.734	-0.784		-0.373	-0.777
			(1.103)	(1.295)		(1.138)	(1.280)
City FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	N	Y	Y	N
Prov-year FE	N	N	N	Y	N	N	Y
First-stage F-stat	-	34.13	30.80	27.99	-	-	-
Observations	2,608	2,608	2,232	2,184	2,608	2,232	2,184
R-squared	0.841	-	-	-	0.843	0.854	0.921

Notes: Observations are at the city-year level for years from 2011 to 2018. The dependent variable is the CJO-recorded criminal cases per thousand working-age population in year t. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. Column (1) reports OLS estimates, and columns (2) to (4) are results from IV regressions. Columns (5) to (7) report results from reduced-form IV regression. Additional time-varying city-level controls in columns (3) to (4) and (6) to (7) are constructed as the change between year t and $t-1$. All control variables are in logs except for the college share. We include city fixed effects and year fixed effects in columns (1) to (3) and columns (5) to (6), and we replace year fixed effects with the province-year fixed effects in columns (4) and (7). Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

rates.[16]

Taking the IV estimation in column (2) as the baseline, a reduction of $1,000 in a city's export per worker would induce 110 additional criminal cases per million working-age population. The effect is sizeable, considering that the average crime rate in our sample is 444 cases per million working-age population. Another method to gauge the importance of export growth on reducing crime rates is to compare the city at the 25^{th} and the 75^{th} percentile of crime rate distribution. A back-of-envelope calculation suggests that nearly 11.6% of the interquartile difference in crime rates could be explained by the difference in their exposure to export slowdown.[17]

Our baseline findings remain when we include a series of time-varying city characteristics in column (3), including log changes in GDP per capita, foreign direct investment (henceforth FDI), population, and finally change in the share of the college-educated population.[18] Column (4) shows that the effect of export shock on crime rates is reduced but remains significantly negative, after controlling for the province-year fixed effects. The smaller estimate implies that part of the identification comes from cross-province comparisons, particularly between coastal versus inland provinces. In all three specifications of IV regressions, the first stage F-stat is well above 10. Furthermore, we present the corresponding first-stage regressions in Appendix Table A.3. Finally, in columns (5)-(7), we directly regress the crime rates on the constructed IV, confirming that foreign import demand has a significant and negative effect on the city's crime rates.

4.2 Heterogeneity Analysis

The granularity of the data allows us to examine the heterogeneous effects of the export slowdown on crime rates. Through these exercises, we focus on the 2SLS specification with fixed effects as column (2) of Table 2. First, we divide the sample by the median value of the young population share, where the young population is defined as those aged between 18 and 30 in the 2010 Population Census. We run separate regressions for cities with high and low young population shares and report the results in columns (1) and (2) of Table 3. The negative impact of the export slowdown on crime rates is most significant among cities with a high share of the young population, while the impact on "older cities" is less significant.

[16] Bias due to reverse causality may work in the opposite direction. For example, cities with lower crime rates may attract more investment and therefore increase exports. An OLS estimation without correcting this type of bias tend to overestimate the impact of the export shock on crime rates.

[17] A hypothetical experiment is also conducted: suppose China has managed to maintain its annual growth rates of exports as these before the global financial crisis, what change would we expect in crime rates? We show that had China maintained its pre-crisis export growth rate at 20%, the crime rates would have decreased by 9.5% from the current level.

[18] Data on these controls comes from the China City Statistical Yearbooks.

Table 3: Heterogeneous Effects of Export Slowdown: Initial City Characteristics

Dep. Var.:	Criminal cases per thousand$_{ct}$										
	Young share		Migration share		Mfg. employment share		By regions			Initial crime level	
	High	Low	High	Low	High	Low	East	Middle	West	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ExpShock$_{ct}$	-0.123***	-0.083	-0.070***	-0.045	-0.101***	-0.055	-0.067***	-0.500***	-0.053	-0.090***	-0.048***
	(0.027)	(0.056)	(0.025)	(0.074)	(0.029)	(0.067)	(0.025)	(0.187)	(0.057)	(0.025)	(0.018)
City FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
First-stage F-stat	22.60	10.62	22.45	15.04	25	15.72	30.27	19.63	3.49	21.35	14.57
Observations	1,304	1,304	1,304	1,304	1,160	1,160	816	832	960	1,304	1,304

Notes: Observations are at the city-year level for the year 2011 to 2018. The dependant variable is the CJO-recorded criminal cases per thousand working-age population in year t, while the main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3) respectively. We run separate regressions for the cities with 50% most and least young share in columns (1) and (2), migration share in columns (3) and (4), manufacturing employment share in colums (5) and (6), and initial crime rate in columns (10) and (11). The regional split in columns (7) to (9) is East, Middle and West according to the division provided by the National Development and Reform Commission. Data on young share and migration share comes from the 2010 Census. Data on manufacturing employment comes from China City Statistical Yearbooks. All columns report IV estimates and include city fixed effects and year fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

This finding is consistent with the empirical evidence for a positive correlation between the young population and crime rates (Freeman, 1991; Grogger, 1998; Khanna et al., 2021).

Second, cities can differ substantially in accommodating migrant workers, who tend to have higher crime rates due to high mobility. In columns (3) and (4) of Table 3, cities are categorized according to their level of initial migration share.[19] Unsurprisingly, we see a negative and significant impact of the export shock in cities with a higher share migration. The effect is still negative but no longer significant for cities with lower-than-median migration share. This finding is consistent with the fact that the migrant population tends to be younger than the local population and also consistent with previous studies that low-skilled immigrants are more likely to commit crime (Rattner, 1997; Aoki and Todo, 2009; Zhang, 2011; Bell et al., 2013; Baker, 2015; Caminha et al., 2017).

Third, we divide cities by the median level of manufacturing employment share in 2010.[20] As most exports from China are manufactured goods, we expect that the export slowdown more severely affects cities with higher manufacturing share. Results reported in columns (5) and (6) confirm this point: the export slowdown has a stronger impact on cities with higher initial share of manufacturing employment.

The impact of the export slowdown on crime rates may also differ geographically. Thus, in columns (7)-(9), we divide cities by their geographical location. Specifically, we categorize

[19]Migrant population share is defined as the share of people who reside in a city where they do not have an urban Hukou. We calculate the migrant population share for each city based on the 2010 Population Census.

[20]The manufacturing employment share is calculated as the proportion of manufacturing employment in total employment, using the 2010 China City Statistical Yearbooks.

Table 4: Heterogeneous Effects of Export Slowdown by Type of Crime

Dep. Var.:	Criminal cases per thousand$_{ct}$						
	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV
Type of crime	Public security	Felony traffic offense	Violence	Robbery	Stealing	Defraudation	Extortion
ExpShock$_{ct}$	0.001	-0.026**	-0.008*	-0.002**	-0.021***	-0.004**	-0.000
	(0.001)	(0.011)	(0.004)	(0.001)	(0.008)	(0.002)	(0.000)
City FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
First-stage F-stat	34.13	34.13	34.13	34.13	34.13	34.13	34.13
Observations	2,608	2,608	2,608	2,608	2,608	2,608	2,608
	(8) IV	(9) IV	(10) IV	(11) IV	(12) IV	(13) IV	(14) IV
Type of crime	Drugs	Prostitution	Gambling	Counterfeiting	IP	Finance	Bribery
ExpShock$_{ct}$	-0.037***	-0.002***	-0.006***	-0.002***	-0.001**	-0.000	0.001
	(0.011)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)
City FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
First-stage F-stat	34.13	34.13	34.13	34.13	34.13	34.13	34.13
Observations	2,608	2,608	2,608	2,608	2,608	2,608	2,608

Notes: Observations are at the city-year level for years from 2011 to 2018. The dependent variable is the type-specific CJO-recorded criminal cases per thousand working-age population in year t. The classification of crime is described in Table A.1. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. All columns report IV estimates and include city fixed effects and year fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

cities into three regions: east, middle, and west.[21] The results show that export shocks make significant changes in crime rates in the east and middle regions but not in the west, and cities in the middle region of China experienced the greatest impact. This pattern is consistent with the fact that manufacturing production was highly concentrated in eastern coastal provinces and gradually shifted toward inland China since 2010 (Brandt and Lim, 2021).

Finally, in the last two columns, we divide the sample at the median level of crime rate to explore whether the export slowdown has a bigger impact in cities where the initial crime rates are relatively high. Results reveal that export slowdown increases the crime rate in both groups, but the effect is larger in cities with higher initial crime rates.[22]

In Table 4, we see how the impact of the export slowdown on crime rates differs by type of crime. As explained in section 2.1, we divide the criminal cases into 14 categories, according to the Criminal Law of the People's Republic of China. We use the textual analysis of

[21]The east region includes provinces of Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan;the middle region includes provinces of Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan; the west region includes provinces of Sichuan, Chongqing, Guizhou, Yunnan, Xizang, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Guangxi, and Inner Mongolia.

[22]We use 2014 instead of 2010 data to calculate the initial crime rates and split the sample, because the CJO was established in 2013 and the sample before 2014 is less complete.

keywords included in the case titles and contents.[23] The results show that a negative export shock would lead to criminal activities such as felony traffic offenses, violence, robbery, stealing, defraudation, drugs, prostitution, gambling, counterfeiting, and IP infringement. By contrast, we find no statistically significant effect on other types of crime.

Overall, export slowdown has more adverse effects on crime in cities specializing in manufacturing production, having a larger share of young or migrant populations, or with higher initial crime rates. This evidence is consistent with the broader narrative that weakening labor market conditions after declining exports would reduce the opportunity costs of committing a crime for these economically vulnerable individuals. They would engage more in criminal activities related to violence, felony traffic offenses, drugs, prostitution, gambling, or involving resource appropriation activities such as robbery, stealing, defraudation, counterfeiting, and IP infringement.

4.3 Robustness Checks

We perform a battery of robustness checks that verify the findings in our baseline estimation. In the following tables, we will adopt the same specification as in column (2) of Table 2.

4.3.1 Basic Robustness Checks

Sample period: We begin with an alternative sample period. In column (1) of appendix Table A.5, we replicate the baseline regression using the sample between 2014 and 2018. This ensures that our estimation results are not influenced by the less complete case reporting in years before 2014. Column (2) also includes the region-year fixed effects. The results in both estimations are similar to the baseline.

Influential observations: Second, to ensure our results are not driven by the presence of very big provinces, we replicate the baseline estimation 31 times, excluding one province at a time. We report the maximum and the minimum coefficient estimates in column (3) of Table A.5. In all cases, we observe meaningful negative and significant estimates. To visualize these results, we present in appendix Figure A.2 the residual scatter plots for both the first-stage and the second-stage regressions in column (2) of Table 2. In the right panel, the horizontal axis presents residual terms obtained from regressing the predicted export shocks in the first stage against variables on the right-hand side of equation (2) excluding $ExpShock_{ct}$. The vertical axis presents residual terms from regressing crime rates against the right-hand side variables in equation (2), again excluding $ExpShock_{ct}$. In the

[23] The full list of keywords in Chinese and their English translation are provided in appendix Table A.1. Table A.4 in the appendix presents the number and share of each type of criminal cases. Felony traffic offences account for the largest proportion, followed by cases related to stealing, violence, drugs and defraudation.

left panel, the vertical variable is the residualized $ExpShock_{ct}$ and the horizontal variable is the residualized $ExpShock_{ct}^{ROW}$. The left panel shows a strong positive correlation between the two variables, consistent with the high F-statistic for the first-stage regression. The right panel reveals a downward-sloping relationship and shows no significant outliers. Moreover, Figure A.3 presents the residual binned scatter plots, where city-year level observations are grouped into 50 bins based on their residualized export shocks. Both panels show a close relationship between the vertical and horizontal variables. Notably, the binned regression estimates a coefficient of -0.113 with a t-value at -4.93, after removing the outlier bin on the right tail.

4.3.2 Other City-level Shocks

One concern for our identification is that the demand shocks that originated from the ROW can be correlated with internal shocks within Chinese cities. To address this concern, we construct several measures to capture the internal shocks and include them as additional controls in equation (2). To be specific, we consider three possible internal shocks that are related to domestic demand, domestic supply, and import demand, respectively. First, we use the change in domestic absorption (i.e., domestic output less net exports, $Absorption_{jt} = Output_{jt} - Export_{jt} + Import_{jt}$) to proxy for domestic demand shock.[24] We apply the same shift-share approach, using each city's initial industrial specialization as weights, to measure the demand shock to each city:

$$AbsorptionShock_{ct} = \Sigma_j \frac{L_{cj,2010}}{\Sigma_c L_{cj,2010}} \frac{\Delta Absorption_{jt}}{L_{c,2010}}. \tag{4}$$

Likewise, we use the change in industrial output to measure the domestic supply shock, where each city's exposure to the supply shock also depends on the initial employment structure:

$$OutputShock_{ct} = \Sigma_j \frac{L_{cj,2010}}{\Sigma_c L_{cj,2010}} \frac{\Delta Output_{jt}}{L_{c,2010}}. \tag{5}$$

Finally, to assess the potential confounding effect of import competition, we measure each city's exposure to the import shock using the same shift-share formula:

$$ImpShock_{ct} = \Sigma_j \frac{L_{cj,2010}}{\Sigma_c L_{cj,2010}} \frac{\Delta M_{jt}}{L_{c,2010}}. \tag{6}$$

Columns (1)-(4) of Table A.6 report the results where we control for these additional

[24] For industry, we use the four-digit Chinese Standard Industrial Classification (CSIC). Data on industry output comes from China Industry Statistical Yearbooks. Initial specialization structure is calculated using industrial employment, base on the 2010 China Annual Survey of Industrial Firms. Data on exports and imports is from China Customs Database. We use a concordance to match the HS 6-digit codes with the CSIC 4-digit industries.

internal shocks. Columns (1) and (2) control for the domestic demand and supply shocks, respectively. Column (3) controls for both shocks together. Column (4) controls for the import shock. In all cases, the estimated export shock coefficient remains negative and statistically significant.

Spatial correlation across cities in the export shocks can also confound the interpretation of our results. To address this concern, we construct a weighted average of the export shocks across all cities that share an administrative border with city c, using their working-age population as weights. This measure controls for the impacts of export shocks experienced by the neighboring cities. We include it as an additional control in equation (2), and use the weighted average of $ExpShock^{ROW}$ as the instrument. The result is reported in column (5) of Table A.6. Both the local export shock and the neighboring export shocks have a negative effect on the crime rate.

Finally, to rule out the possibility that our findings might be driven by some unobserved stochastic trends common to crime rates and exports, we randomly assign $ExpShock$ to cities and repeat the IV regressions 500 times. Appendix Figure A.4 displays the distribution of estimates obtained from the 500 simulations. We highlight our baseline estimate with a red vertical line in the figure for comparison. As the figure shows, estimates obtained from the simulated samples are centered around zero, while the benchmark estimate is beyond the 95 percentile of the distribution.

4.3.3 Validity of the Shift-Share Instrument

The validity of our identification strategy relies on the assumption that the instrument reflects aggregate foreign demand in the export destinations but is independent of Chinese firms' export decisions. Given the shift-share structure of the instrument, it requires that conditional on the year- and city-fixed effects, other unobserved factors in the error term are uncorrelated with (1) the product-specific foreign demand shocks observed at the national level (i.e., the shifts) and (2) the initial city-product-specific export share (i.e., the shares). We perform several checks to test these two assumptions. In addition, we show that our estimates do not suffer from the pre-trend and pass other statistical tests suggested by the shift-share literature.

The Exogeneity of the shifts: We first test for assumption (1). The exogeneity of the shifts can be violated if some products with stronger demand shocks tend to be concentrated in cities with certain characteristics that are also related to the crime rate. To address this issue, we run a balance test as suggested by Borusyak et al. (2022). In particular, we examine whether our product-level shifts are correlated with the exposure-weighted average of initial city-level characteristics.

Our shift-share IV can be written in the general form of $\Sigma_k s_{ck} g_{kt}$. In our setting $g_{kt} = \frac{\Delta X_{kt}^{ROW}}{\Sigma_c X_{ck,2010}}$ is the demand shock of product k from the ROW divided by the total export of product k from China in 2010. And $s_{ck} = \frac{X_{ck,2010}}{L_{c,2010}}$ is city c's export of product k divided by its initial working-age population, which measures city c's exposure to the shock to product k. Borusyak et al. (2022) prove that the validity of the instrument relies on:

$$\Sigma_k s_k g_{kt} \phi_k \xrightarrow{p} 0, \tag{7}$$

where $s_k = E(s_{ck})$ is the expectation of the exposure to product k's shock across cities, $\phi_k = \frac{E(s_{ck}\epsilon_c)}{E(s_{ck})}$ is the expectation of certain initial characteristic (ϵ_c) of city c, weighted by its exposure measure s_{ck}. Equation (7) suggests that weighed by s_k, the correlation of g_{kt} and ϕ_k goes to zero in a large sample, in which case product-level demand shocks from the ROW are as good as randomly assigned across cities. To check this property, we regress g_{kt} on ϕ_k and the year dummies using weighted least squares with s_k as weights. Besides the initial city-level crime rate $(Crime/L)_{c,2010}$, we also consider in ϕ_k a set of predetermined city characteristics in 2010, including the share of population with college degree, manufacturing employment share, exports as a share of GDP, share of population without Hukou registration, GDP per capita, and fiscal expenditure per capita. Table A.7 report the coefficients and the standard errors for each city-level variable, and the joint χ^2 stat. The coefficients are all statistically insignificant, indicating that our product-level export shocks meet the requirement of treatment balance.[25]

The Exogeneity of the shares: We next examine the assumption (2): the initial city-product-specific export share (i.e., the share) is not correlated with the unobserved error. As highlighted by Goldsmith-Pinkham et al. (2020), the assumption that the Bartik shares are exogenous can be violated if the city's exposure to export shocks is driven by a small number of products that experience particularly large shocks or predetermined trends. We implement the check suggested by Goldsmith-Pinkham et al. (2020) and compute the Rotemberg weights for export shocks with city- and year-fixed effects. The product-specific Rotemberg weights capture the degree of sensitivity to mis-specifications when the exogeneity assumption of initial export shares fails. The 2SLS estimates are more sensitive to the bias introduced by a product with a large Rotemberg weight. In Table A.8, we report five 6-digit HS products with the highest Rotemberg weights. The top five products account for 12.2% of the positive weights in the shift-share estimator, which is far lower than the cases studied in Goldsmith-Pinkham et al. (2020).

[25] In our sample, the Herfindahl index based on the initial export structure in 2010 is 0.0056, which implies an effective sample size of 1420 (i.e., 8/0.0056).To compute the Herfindahl index, we re-normalized the expectation of the exposure measure s_k so that they sum to one. Since our panel covers 8 years, the effective sample size is decided by 8/ HHI.

We then adopt the method of dropping one HS section at a time to assess whether our estimation relies on large shocks to any particular products. To be specific, we follow Campante et al. (2019) and re-run the 2SLS regressions excluding one HS section at a time.[26] We report the maximum and minimum coefficient estimates with their standard errors in column (1) of Table A.10. Both the maximum and the minimum estimates remain highly significant and negative, suggesting that our baseline results are not driven by particular products.

Incomplete shares: Another concern on the Bartik shares is related to the "incomplete shares" problem as suggested by Borusyak et al. (2022). That is, the initial export exposure per worker ($\Sigma_k s_{ck} = \Sigma_k X_{ck,2010}/L_{c,2010} = X_{c,2010}/L_{c,2010}$) could be correlated with the city-specific linear time trends in crime rates. We follow Campante et al. (2019) to further augment the baseline model by controlling for the interaction between the manufacturing export exposure of the initial period ($X_{c,2010}/L_{c,2010}$) and the year dummies. The results are reported in Table A.11. Panel A presents the results of IV regressions with these additional controls, and panel B reports the results based on the reduced-form specifications. The estimates in column (1) resemble closely the baseline findings. Since $X_{c,2010}/L_{c,2010}$ tends to be relatively skewed, we implement a less parametric approach in which we interact the year dummies with indicator variables for the terciles of $X_{c,2010}/L_{c,2010}$. The results in column (2) of Table A.11 suggest that our baseline estimates remain robust.

4.3.4 Other Statistical Tests

Pre-trend test: In columns (2) of Table A.10, we further examine whether the estimated effects come from a coincidental correlation between pre-existing city-specific trends and future export shocks. As the export shock at time $t+1$ is constructed as the difference in exports per worker between $t+1$ and t, potentially correlated with the outcome variable measured in year t, we therefore project the number of criminal cases in year t onto the export shock in $t+2$, and instrument for future export shock using the Bartik variable $ExpShock^{ROW}_{c,t+2}$. The coefficient estimate of $ExpShock_{c,t+2}$ would be statistically significant if pre-existing trends are indeed a concern, which is not supported by results shown in column (2). Thus, these results suggest that cities hit harder by the negative export shocks were not already experiencing deterioration in crime incidents.

Alternative source of variations: The final concern on the instrument lies in the measurement. To utilize more detailed information of the destination market, we construct

[26] The HS sections and their corresponding HS codes are listed in Table A.9 in the Appendix.

an alternative measure of $ExpShock_{ct}^{ROW}$ based on the destination-specific demand shocks:

$$ExpShock_{ct}^{ROW} = \Sigma_k \Sigma_{d \neq CHN} \frac{X_{cdk,2010}}{\Sigma_c X_{cdk,2010}} \frac{\Delta X_{dkt}^{ROW}}{L_{c,2010}}, \tag{8}$$

where X_{dkt}^{ROW} denotes country d's imports of product k from the ROW in year t. The share term $\frac{X_{cdk,2010}}{\Sigma_c X_{cdk,2010}}$ reflects the importance of city c in China's total exports of product k to destination d in 2010. Compared with equation (3), here the alternative measure of foreign demand shock combines more disaggregate information on the destination market and each city's relative market share in each destination market. The results are reported in column (3) of Table A.10, showing very close estimate to the baseline regression.

Alternative statistical inference: Finally, we evaluate the robustness of our results by clustering the standard errors at several alternative levels. In column (1) of Table A.12, we cluster the standard errors at the province level to allow for the existence of within-province across-city correlation. As pointed out by Adao et al. (2019), cities located in different provinces may have similar industry/export structure and therefore experience correlated shocks. To take this possible correlation into consideration, we follow Campante et al. (2019) and compute the similarity of city c's initial export structure with that of the provincial capital city j based on the index proposed by Finger and Kreinin (1979):

$$SimilarityIndex_{cj} = \Sigma_k min\left\{\frac{X_{ck}}{X_c}, \frac{X_{jk}}{X_j}\right\}, \tag{9}$$

where X_{ck} (X_{jk}) denotes the export of product k originating from city c (j) to the ROW in year 2010, and X_c (X_j) is the total exports of city c (j). This index takes values between 0 and 1, and a higher value indicates a higher degree of similarity between two cities in their export structure. In practice, we assign each city to an export-similarity cluster corresponding to the provincial capital with highest $SimilarityIndex$.[27] We eventually create 31 clusters, and each cluster has 11 cities on average. Column (2) of Table A.12 reports the results with errors clustered at the export-similarity group. In column (3), we re-assign each city to an export-similarity cluster corresponding to the provincial capital outside of its own province with which its export profile shows the highest similarity. In columns (4) and (5), robust standard errors are two-way clustered at the province and the export-similarity group level, and at the province and the outside-of-province export-similarity group level, respectively. All baseline results remain robust to these alternative clustering specifications.

[27] We can not directly implement Adao et al. (2019)'s procedure to correct the standard errors since there are more product-level trade shocks (>4,000 HS6-digit code) than geographic units (326 cities) in our sample.

5 Mechanism Analysis

In this section, we examine two main explanations for why export slowdown has caused rising incidence of crime across Chinese cities. First, the rise in crime rates might be a result of worsening labor market conditions, in the spirits of Britto et al. (2022), Rose (2018), Bennett and Ouazad (2020) and Khanna et al. (2021). Secondly, the rise in crime rates may be associated with reducing expenditure of the local governments on stability maintenance. For the following analysis, we adopt the same estimation specification as the baseline, replacing $(Crime/L)_{ct}$ with the economic outcome variables of interest.[28]

5.1 Employment and Earning

First, we directly estimate how export shocks affect the employment at the city level. Results in columns (1) to (2) of Table 5 suggest that cities with more severe export slowdown experience greater reduction in manufacturing employment but no significant change in services employment.

Given the large population of migrant workers in China, we next consider how would the deteriorating labor market conditions change the migration patterns (Stark et al., 2009; Boustan et al., 2020; Langella and Manning, 2022). We compute migration flows for each city using micro-data from the 2015 Chinese Population Census.[29] Columns (3)-(6) report the results, where columns (3) and (5) use the log of city-level migration inflows and outflows while columns (4) and (6) use the share of migration inflows and outflows relative to the initial working-age population in 2010. Cities that are more exposed to the negative manufacturing export shock tend to fewer migration inflows and larger migrant outflows.

Finally, in columns (7) and (8), we present evidence that the export slowdown decrease job availability. Specifically, we construct job flow measures following Davis and Haltiwanger (1992) and Ma et al. (2015) using firm level employment information from the National Tax Survey (2012-2015).[30] Results indicate that the export slowdown reduces job creation while increasing job destruction.

Next, we study how the export slowdown affects labor earnings in Table 6. Column (1) looks at urban disposable income per capita, while column (2) uses the average city wage. Both numbers are from the China City Statistical Yearbooks. We find that the export slowdown significantly reduces urban household's disposable income, but has insignificant effect

[28] Table A.2, panel B reports the summary statistics of all variables used for the mechanisms analysis.

[29] Following Imbert et al. (2022), we only include migrants who were 15 to 64 years at the time of migration. For details on the Chinese Population Census and the measurement of internal migration, see Data Appendix C.

[30] The National Tax Survey is collected by China's Ministry of Finance and State Administration of Taxation. Details on measuring job creation and job destruction are provided in Appendix D.

Table 5: Mechanism: Export Shocks and Employment

Dep. Var.:	Labor market condition measures$_{ct}$							
	(1) Log Mfg. empl.	(2) Log Svc. empl.	(3) Log Migrant-in	(4) Migrant-in / 1k-workers	(5) Log Migrant-out	(6) Migrant-out / 1k workers	(7) Job creation	(8) Job destruction
ExpShock$_{ct}$	0.100***	-0.018	0.289***	0.369*	-0.238**	-0.238***	0.008	-0.010*
	(0.038)	(0.012)	(0.107)	(0.212)	(0.095)	(0.086)	(0.006)	(0.006)
City FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
First-stage F-stat	31.43	31.43	23.09	23.45	23.55	23.55	9.16	10.29
Observations	2,320	2,320	1,577	1,630	1,616	1,616	1,191	1,220

Notes: Observations are at the city-year level. Dependent variables in columns (1) and (2) are the log of manufacturing employment and service employment in year t respectively, which are computed from the China City Statistical Yearbooks (2011 - 2018). Dependent variables in columns (3) and (4) are the log of total migration inflows and migration inflows per hundred workers in year t. Dependent variables in columns (5) and (6) are the log of total migration outflows and migration outflows per hundred workers in year t. Migration flows are computed from the 2010 and 2015 1% Population Census. Dependent variables in columns (7) and (8) are the job creation rate and job destruction rate constructed following Davis and Haltiwanger (1992), which are computed from the National Tax Survey (2012 - 2015). Observations at or below the 1st percentile and at or above 99th percentile are dropped as outliers. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

on the average wage. Since the average wage reported in the China Statistical Yearbooks does not distinguish employment across sectors and may under-represent private firms, we further exploit the National Tax Survey to compute the output-weighted firm payroll. Results are reported in columns (3) and (4), for manufacturing and service sectors respectively. Negative export shock lowers manufacturing labor earnings and has no significant effect on wages in the services sector.

Taken together, this set of evidence is consistent with the hypothesis that the export slowdown reduces employment opportunities and lowers wages, especially for the manufacturing sector. Our estimation shows that a $1,000 reduction in exports per worker would lead to 10.5% decline in employment and 10.8% drop in average wage in the manufacturing sector. By contrast, export shocks have a less significant effect on employment and labor earnings in the services sector.

5.2 Labor Disputes

Displacing workers in bad times may also trigger labor disputes between workers and their employers. The CJO database provides a unique opportunity to explore this linkage. First, we identify civil cases related to labor disputes by applying the textual analysis of keywords included in the case titles or contents.[31] Then, we count the number of labor

[31] Appendix Table A.13 provides a summary of the keywords associated with each type of labor disputes.

Table 6: Mechanism: Export Shocks and Labor Income

Dep. Var.:	Labor market condition measures$_{ct}$			
	(1) Log Urban disposable income per capita	(2) Log Average wage	(3) Log Manufacturing wage	(4) Log Service wage
ExpShock$_{ct}$	0.017***	0.0004	0.103**	0.081
	(0.005)	(0.010)	(0.046)	(0.062)
City FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
First-stage F-stat	31.30	31.43	23.37	23.37
Observations	2,264	2,320	1,600	1,600

Notes: Observations are at the city-year level. Dependent variables in columns (1) and (2) are the log of urban disposable income per capita and average wage in year t, which are computed from the China City Statistical Yearbooks for the year (2011 - 2018). Dependent variables in columns (3) and (4) are the log of manufacturing wage and service wage in year t, which are computed from the National Tax Survey (2011 - 2015). The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Mechanism: Export Shocks and Labor Disputes

Dep. Var.:	Labor disputes per thousand$_{ct}$			
	(1) Total labor disputes	(2) Wage-arrears related disputes	(3) Layoffs-related disputes	(4) Labor service disputes
ExpShock$_{ct}$	-0.056***	-0.030***	-0.007**	-0.008**
	(0.018)	(0.010)	(0.003)	(0.004)
City FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
First-stage F-stat	34.13	34.13	34.13	34.13
Observations	2,608	2,608	2,608	2,608

Notes: Observations are at the city-year level for years from 2011 to 2018. The dependent variable is the CJO-recorded labor disputes per thousand working-age population in year t, whose type is indicated in the column heading. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

disputes and categorize them into wage arrears-, layoff-, and labor service-related types.[32] Table 7 report the results: column (1) uses the total number of labor disputes per thousand working-age population as the dependent variable, while columns (2) to (4) break down the total number by the category of the dispute. In all specifications, we find that the export slowdown leads to rising number of labor disputes. Our finding is also consistent with the findings by Campante et al. (2019), who show that the negative export shock induces rising incidents of labor strikes.

5.3 Other Economic Outcomes

Table 8 investigates the effect of export shocks on a set of other economic outcomes. Consistent with previous results on employment, we find that the export slowdown induces a significant decline in the share of manufacturing employment (column (1)), accompanied by a large shift in employment composition toward services sector (column (2)). We also find that the adverse export shock leads to a fall in gross industrial output per worker (column (3)) and in the GDP of the secondary sector (column (4)), while it has no impact on the GDP of the tertiary sector (column (5)).[33]

Columns (6)-(11) in the lower panel of Table 8 consider the patterns of firm entry across cities and by sectors. We focus on the number of new firms based on their registration information recorded in the China Administrative Firm Registration Database. Columns (6)-(8) define new firms as those created and assigned with a unique administrative registration code in each year, while in columns (9)-(11), new firms refer to those whose administrative registration code was changed in each year.[34] Through all regressions, we observe that the export slowdown discourages firm entry in both the manufacturing and the services sectors.

5.4 Provision of Local Public Services

Another channel through which the adverse trade shocks may induce crime is by reducing local fiscal revenue. Shrunk fiscal income limits the provision of local public services (Feler and Senses, 2017), which as a consequence makes crime incidents harder to prevent. We explore the likelihood of channel by examining two categories of government spending that

[32]The difference between labor disputes and labor service disputes is as follows: Labor disputes are disagreements between legal persons (i.e., employing units) and physical persons (i.e., employees) with formal labor contracts, while labor service disputes refer to conflicts regarding the service content between service receivers and service providers.

[33]The secondary sector includes mining, manufacturing, construction, and the supply of utility (electricity, heat, gas, and water). The tertiary sector involves the provision of services to other businesses and to consumers, including for example transportation, communication, distribution, sales, and financial services.

[34]In the second definition, a firm would be treated as a new entry if it is newly invested by another firm (and therefore receives a new registration code).

Table 8: Mechanism: Export Shocks and Other Economic Outcomes

Dep. Var.:	Economic outcome$_{ct}$					
	(1) Mfg. empl. / worker	(2) Svc. empl. / worker	(3) Log Ind. output per worker	(4) Log Sec. GDP	(5) Log Ter. GDP	
ExpShock$_{ct}$	0.013**	-0.015***	0.119*	0.052**	-0.002	
	(0.006)	(0.006)	(0.062)	(0.026)	(0.008)	
First-stage F-stat	31.43	31.43	24.96	31.44	31.44	
Observations	2,320	2,320	1,722	2,304	2,304	
	(6) Log # of new firms1	(7) Log # of new Mfg. firms1	(8) Log # of new Svc. firms1	(9) Log # of new firms2	(10) Log # of new Mfg. firms2	(11) Log # of new Svc. firms2
ExpShock$_{ct}$	0.122***	0.232***	0.112***	0.121***	0.222***	0.111***
	(0.037)	(0.061)	(0.038)	(0.038)	(0.062)	(0.039)
First-stage F-stat	32.18	32.18	32.18	32.18	32.18	32.18
Observations	2,261	2,261	2,261	2,261	2,261	2,261
City FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Notes: Observations are at the city-year level. Dependent variables in columns (1) to (5) are the manufacturing and service employment share, the log of industrial output per worker, and the log of secondary and tertiary GDP in year t respectively, which are computed from the China City Statistical Yearbooks (2011 - 2018). Dependent variables in columns (6) to (11) are the log of the number of new firms in year t, which are computed from the China Administrative Firm Registration Database (2011 - 2017). In columns (6), (8), and (10), new firms are those created and assigned with (unique) administrative registration number in each year, which we indexed with "firms1"'; in columns (7), (9), and (11), new firms refer to those whose administrative registration number was changed in each year (e.g., due to M&A), which we index with "firms2".The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Stability Maintenance Expenditure

Dep. Var.:	Log fiscal measures$_{ct+1}$				
	(1) Total Fiscal Revenue	(2) Total Fiscal Expenditure	(3) Public Security	(4) Social Spending	(5) Stability Spending
ExpShock$_{ct}$	0.001	-0.019	-0.014	-0.037**	-0.036**
	(0.035)	(0.019)	(0.021)	(0.017)	(0.016)
City FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
First-stage F-stat	30.36	30.36	27.49	10.93	10.32
Observations	2,030	2,030	1,743	1,295	1,267

Notes: Observations are at the city-year level. Fiscal data comes from Fiscal Statistical Yearbooks, Province Statistical Yearbooks, and City Statistical Yearbooks. The dependent variables are the log of fiscal measures in year $t+1$. The fiscal measures we consider include total fiscal revenue (column 1), total fiscal expenditure (column 2), fiscal expenditure on public security (column 3), fiscal expenditure on "social spending" (column 4), and fiscal expenditure on "stability spending" (column 5), where "stability spending" is the sum of public security expenditure (which includes all expenses by the People's Armed Police, prosecutorial system, the court system, judicial system, and public security organs) and "social spending" (which is the sum of expenditure on public services, education, social security, medical services, urban and rural affairs, and public housing). All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

are most relevant to social stability maintenance.[35] The first is the fiscal spending on public security, which includes all expenses by the People's Armed Police, judicial and prosecutorial system, and public security organs. The second is the "social spending", which is the sum of expenditure on public services, education, social security, medical services, urban and rural affairs, and public housing. As the budgets of China's government are usually initiated one year in advance, public expenditure is likely delayed in response to export shocks. For this reason, the outcome variables are measured at $t+1$.

The results are reported in Table 9. We use the log of fiscal revenue or expenditure of city c in year $t+1$ as the dependent variables. Column (1) uses total fiscal revenue, column (2) uses total fiscal expenditure, column (3) looks at public security spending while column (4) considers social spending, and finally column (5) uses the total spending on stability maintenance, which equals the sum of the public security and social spending. The first two columns show that the export slowdown tends to decrease a city's fiscal revenues but increase its expenditure, though both are statistically insignificant. Notably, cities with more severe export slowdown spend more on social spending, but do not significantly increase their public security expenditure. The total spending on stability is increased due to export slowdown. Given the documented linkage between worsening labor market outcomes and higher crime rates, these results suggest rising spending on stability maintenance as a *response* to rising crime incidence, instead of a *cause* of crime. Therefore, we conclude that spending on stability plays a minor role in explaining the negative association between export shocks and crime rates.

6 Theoretical Analysis

In this section, we propose a theoretical model to understand the mechanisms behind our findings. We formalize a simple theoretical framework, based on Dinopoulos and Unel (2015) and a standard set of assumptions, to characterize both households' and firms' decisions in a general equilibrium setting. To let the likelihood of criminal activity respond to external shocks, the model allows for a more flexible occupation choice so that workers have free entry into the appropriation sector following Bó Dal and Dal Bó (2011). Therefore, the number of criminals is determined by the equality of wage in the production sector and the return in appropriation sector.

To keep the analysis tractable, we study an economy consisting of two symmetric coun-

[35] There is no one-step repository of city-level fiscal data in China, thus we collect detailed fiscal expenditure information from several sources, including the Fiscal Statistical Yearbooks published by the provincial Bureaus of Finance, the Statistical Yearbooks published by the provincial Bureaus of Statistics and by the city-level Bureaus of Statistics, as well as the balance sheets from city government websites when there are missing values in publicly available sources.

tries, each populated with a unit mass of individuals. Individuals differ in their innate ability a, which follows a *c.d.f.* $G(a)$ with a density function $g(a)$ at support $[a_{min}, +\infty)$. There are three occupations: workers (W), criminals (C), and entrepreneurs (E). An individual makes her occupational decision to maximize the net income based on her innate ability and the labor market conditions. There are two productive sectors: the final good sector and the intermediate goods sector. The final goods are assumed to be non-tradable and in perfect competition, and they are produced by aggregating a variety of intermediate goods in the CES form. Final goods are used for consumption and pay investment and fixed export costs. The intermediates goods sector is tradable and in monopolistic competition, and each differentiated intermediate good is produced by one firm set up by an entrepreneur. In addition to the productive sectors, there exists an appropriation sector. This sector only uses criminals and produces a redistribution of output from the productive sectors towards the appropriation sector.

6.1 Household

Households consist of workers, criminals, and entrepreneurs. An individual maximized his utility by making the occupation choice and consuming final goods Q_c:

$$\begin{aligned} max_{i\in\{W,C,E\},q(\omega)}\ & Q_c = \left(\int_{\omega\in\Omega} q(\omega)^{\frac{\sigma-1}{\sigma}} d\omega\right)^{\frac{\sigma}{\sigma-1}}, \\ s.t. \qquad & PQ_c \leq w_i(a), \end{aligned} \tag{10}$$

where Ω represents the mass of differentiated products, and $q(\omega)$ denotes the quantity of variety ω. The parameter σ represents the elasticity of substitution between any two varieties, and we let $\sigma > 1$. In the budget constraint, P is the price index of final goods, and $w_i(a)$ denotes the net income received by an individual with ability a and job i. As a worker, he participates in production work and earns a wage that is normalized to unity (i.e., $w = 1$). As an entrepreneur, he invests in firms and hires workers, and collects profit $\pi(a)$ depending on his ability. A criminal makes a living by stealing a portion of workers' and entrepreneurs' earnings. The appropriation in the economy is governed by the technology function $A(L_c)$, and we assume it increases with the overall mass of criminals L_c. Thus, the disposable income of the individual with ability a and occupation i is:

$$w_i(a) = \begin{cases} 1 - A(L_c) & i = W \\ A(L_c)(\Pi + L_p)/L_c & i = C \\ \pi(a) & i = E, \end{cases} \tag{11}$$

where Π denotes the aggregate profit including the portion being stolen, and L_p is the total mass of production workers. Notably, the likelihood of committing a crime positively depend on legal sources (i.e., firm profits and wage bills) and negatively on return to manufacturing labor.

6.2 Production

Each firm produces a differentiated intermediate input and is set up by an entrepreneur. The production function is:

$$q(\varphi) = \varphi^{\frac{1}{\sigma-1}} l_p, \tag{12}$$

where l_p denotes the number of hired production workers. Firm productivity is captured by $\varphi^{\frac{1}{\sigma-1}}$, and increases with the effort invested by the manager φ in operating the business. We assume that the cost of investing φ for a manager with ability a is $f(\varphi, a) = \frac{\lambda\varphi^2}{2a}$, and the parameter λ captures all other factors affecting productivity investment costs common to all managers. Accordingly, more talented entrepreneurs pay lower cost of creating and maintaining business that are necessary for enhancing productivity.

Once a firm is established, an entrepreneur also makes the export decision, on top of choosing optimal labor input, price, and output. Provided with the demand for each intermediate good, an entrepreneur chooses the managerial effort φ, pricing rule p and exporting status $\mathbb{I}_x$ to maximize firm profit subject to the risk of being stolen. Thus, firms' profit-maximization problem can be written as:

$$\max_{p_d(a), p_x(a), \varphi(a), \mathbb{I}_x} \pi(a) = (1 - A(L_c)) \left[p_d(a) q_d(a) - \frac{q_d(a)}{\varphi(a)^{\frac{1}{\sigma-1}}} + \mathbb{I}_x \left(p_x(a) q_x(a) - \frac{\tau q_x(a)}{\varphi(a)^{\frac{1}{\sigma-1}}} \right) - \frac{\lambda \varphi^2(a)}{2a} - \mathbb{I}_x f_x \right] \tag{13}$$

where the subscripts d and x represent domestic firms and exporters, respectively. Serving the foreign market involves an additional fixed cost of $f_x > 0$ and an iceberg variable trade cost, such that $\tau > 1$ units of variety have to be exported in order for one unit to arrive in the foreign market. Given love-of-variety in producing final goods and a fixed production cost of exporting, no firms will serve the foreign market without also serving the domestic. The manager of exporters allocates firm's output between the domestic and foreign market to equate firm's marginal revenues between the two markets.[36]

6.3 Occupation Choice

Occupational choice is pinned down by maximizing household's disposable income. Households with ability a chooses her occupation after observing net return of each occupation

[36] Appendix E provides the detailed derivations of the full model.

return, i.e., $w_i(a), i \in \{W, C, E\}$. Particularly, free entry between workers and criminals equalizes the payoffs of them in the equilibrium.

A citizen chooses to become an entrepreneur if and only if the net return of being an entrepreneur is no less than that of being a worker (or a criminal). As we show in Appendix E that profits of a non-exporter increases with the entrepreneur's ability a, there exists an ability cutoff such that an individual with threshold ability is indifferent between becoming an entrepreneur and a production worker (or a criminal). Let a^* be the talent cutoff, and the above condition is characterized by $1-A(L_c) = (1-A(L_c))\frac{\kappa_1^2}{2\lambda}P^{2\sigma-2}R^2a^*$, where the left-hand side denotes the earnings of a worker (or a criminal), and the right hand side represents the profit of a domestic firm with innate ability a^*. It is characterized by the following equation:

$$a^* = \frac{2\lambda}{\kappa_1^2}P^{2-2\sigma}R^{-2}, \tag{14}$$

where R denotes the total sales on final goods and $\kappa_1 = (\frac{\sigma}{\sigma-1})^{-\sigma}\frac{1}{\sigma-1}$ is a constant. Any individual with ability below a^* chooses to be a production worker or a criminal and earn $1 - A(L_c)$, while the rest will become an entrepreneur producing intermediate good and receive firm profits.

Due to selection to exporting, only entrepreneurs with high enough managerial ability will serve the foreign market, which allows them to obtain a higher entrepreneurial income. The export cutoff can be derived by equalizing profits of exporters and non-exporters at the cutoff ability level. Let a_x^* be the export cutoff, and above condition is characterized by $(1 - A(L_c))\frac{\kappa_1^2}{2\lambda}P^{2\sigma-2}R^2a^* = (1 - A(L_c))\big(\frac{\kappa_2^2}{2\lambda}P^{2\sigma-2}R^2a^* - f_x\big)$, where the right hand side denotes the net profit of an exporter with innate ability a_x^*. It is characterized by the following equation:

$$a_x^* = \frac{f_x}{2\tau^{1-\sigma} + \tau^{2-2\sigma}}a^*. \tag{15}$$

Any entrepreneur with ability above a_x^* will serve the foreign market, whereas the rest will only sell domestically. To be consistent with empirical finding that only larger and more productivity firm export (i.e., $a_x^* > a^*$), we limit parameters at $f_x > 2\tau^{1-\sigma} + \tau^{2-2\sigma}$. The parameter restrictions are provided in Assumption 1:

Assumption 1. *Fixed cost of exporting f_x is large enough so that :*

$$f_x > 2\tau^{1-\sigma} + \tau^{2-2\sigma}$$

As the right hand side of the inequality $2\tau^{1-\sigma} + \tau^{2-2\sigma}$ decreases with τ, $f_x > 3$ is sufficient to ensure it holds.

The return to crime is pinned down by the free entry between workers in productive sectors and criminals in appropriation sector, which equalizes the payoffs of them in the equilibrium:

$$\frac{A(L_c)(\Pi + L_p)}{L_c} = 1 - A(L_c). \tag{16}$$

where the left hand side of (16) denotes the average yields in appropriation sector and the right hand side for return to productive workers netting out the portion being appropriated. For simplicity and without loss of generality, we make the following assumption that appropriation in the economy is increasing in the amount of labor devoted to such activity and that scale effect in appropriation increases its average yields, which we specify in Assumption 2:

Assumption 2. *Technology of the appropriation sector is governed by* $A(L_c) = AL_c^{\alpha}$, *where* $(A > 0)$ *and parameters satisfy the following conditions:*

$$\alpha > \frac{\theta\sigma - \theta + 1}{\theta\sigma - \theta}, \quad \textit{and} \quad A > \frac{(2\theta\sigma - \theta - 1)^{\alpha+1}}{\theta(2\theta\sigma - 2\theta)^{\alpha-1}(4\theta\sigma^2 - 4\theta\sigma - 4\sigma + 3)}$$

where the parameter A measures the overall technology influencing the portion in income of productive citizens being stolen. All else equal, a higher A means a larger portion of workers' and entrepreneurs' earnings can be stolen. The term α measures the degree of scale effect in redistributing output from the productive sectors towards the appropriation sector. We assume criminal activities exhibit a strong degree of scale effect, as captured by $\alpha > 1$.[37]

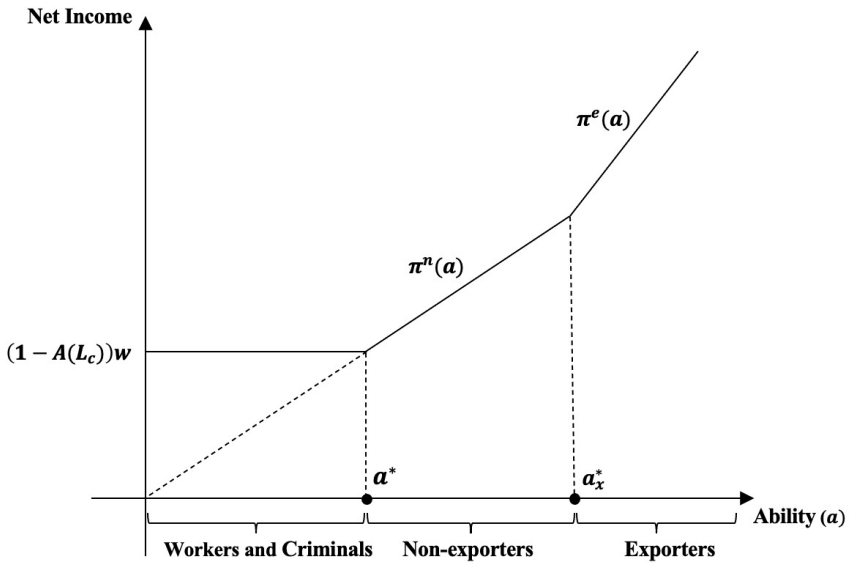
Finally, occupational return profile consists of three working class, namely, the criminals receiving average yields in appropriation sector, the blue-collar workers earning a unit wage, the domestic firm and exporting firm managers earning firm profits. The ability sorting across occupations is displayed in Figure 4, where the ability requirement increases from workers and criminals to big entrepreneurs.

6.4 Impact of Exports Slowdown

Having characterized benchmark model, we now turn to our main objective: analyzing how exports slowdown, modeled as a rise in trade cost and exporting fixed cost, affects the

[37] The increasing returns to the scale of the criminal activity is evidenced from Dell et al. (2019) who study the impact of the major drug trafficking organizations (DTO) in Mexico. For instance, Dell et al. (2019) find that DTOs hire extensive lookouts to monitor the movements of authorities and competing DTO operatives, which makes them more efficient and profitable in drug trade and hence dominate US wholesale illicit drug markets. In Appendix E.2, we show that there exists a unique symmetric equilibrium in the two-country economy under Assumptions 1 and 2. We also explain how the range of parameters α and A in Assumption 2 are determined.

Figure 4: Equilibrium Occupation Sorting



proportion of citizens participating in the appropriation sector, i.e., the crime rates. Our key results are formally presented by Proposition 1.

Proposition 1. *Under Assumptions 1 and 2, exports slowdown, captured by an increase in τ or f_x), increases crime rates.*

The detailed proof of Proposition 1 is provided in Appendix E.3. An increase in trade costs raises the production costs and hence reduces the demand for production workers, which lowers workers' real income and is consistent with our empirical findings. Proposition 1 suggests that if the scale effect and the incentive of crime are large enough in appropriation activity, exports slowdown induces greater participation in criminal activities as a consequence of diminishing labor demand.[38]

7 Conclusion

In this paper, we investigate the criminogenic consequence of China's sharp export slowdown during a period of *secular stagnation* (Summers, 2014, 2015). Home to nearly 150 million manufacturing workers, China has been relying on exports to generate enough jobs in manufacturing and associated service sectors. Our study indicates a sizable impact of the export slowdown on crime rates: a reduction of $1,000 in a city's export per worker is predicted to induce 110 additional criminal cases per million working-age population.

[38]The proof is provided in Appendix E.4.

Our analysis is based on novel measures of various types of crime, which are constructed from detailed textual analysis of judicial documents disclosed by all levels of Chinese courts. Adopting the now widely-used shift share approach, we identify the causal effect of the export slowdown on crime rates utilizing variations across cities in their exposure to exogenous foreign demand shocks. To the best of our knowledge, this is the first paper that exploits the detailed courts judgement documents and establishes the causal linkage between export shock and crime in China.

We document substantial heterogeneity in the criminogenic response to adverse export shocks, depending on industrial and demographic structure of cities. Cities that rely more on manufacturing production and that have higher proportions of young or migrant population experienced larger increase in crime due to sluggish exports. Regarding various types of crime, we find that the export slowdown has more pronounced effects on offenses related to resource appropriation, such as robbery, stealing, defraudation, counterfeiting, or IP infringement, and criminal activities involving violence, drugs, prostitution, and gambling.

Our work shows that adverse export shocks cause fewer jobs, lower wage earnings, and more labor disputes. We show that weakening labor market condition is the main reason for rising crime rates. In a broader sense, our work calls for more attention on the socioeconomic consequences of economic slowdown. In a world where many advocate de-globalization, policy makers should make as the centerpiece policies that attenuate the disruptive impacts of stagnating exports.

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Online Appendix

A Tables & Figures

Table A.1: Keywords in Criminal Case Classification

Types	Chinese	English
1 Public security	失火	negligent arson
	决水	breaching a dike
	投放危险物质	spreading dangerous materials
	破坏交通工具	sabotaging transportation vehicle
	破坏交通设施	sabotaging transportation facility
	破坏电力设备	sabotaging any electric power or gas facility
	破坏易燃易爆设备	sabotaging any inflammable or explosive equipment
	破坏广播电视设施, 公用电信设施	sabotaging any broadcasting, television or public telecommunications facility
	重大飞行事故	causing a grave air accident
	铁路运营安全事故	causing a railway operational accident
	危险物品肇事	violating the regulations on the control of dangerous materials and thereby causing a serious accident
	工程重大安全事故	lowering the quality standard of a construction project and thereby causing a serious accident
	教育设施重大安全事故	failing to adopt measures against dangers in educational facilities and thereby causing a serious accident
	消防责任事故	violating the regulations on fire prevention and causing a serious accident
	不报, 谎报安全事故	not reporting or not truly reporting when accident happens
	非法制造, 买卖, 运输, 邮寄, 储存枪支, 弹药, 爆炸物	illegally manufacturing, trading in, transporting, mailing or storing any guns, ammunition or explosives
	非法制造, 买卖, 运输, 储存危险物质	illegally manufacturing, trading in, transporting, mailing or storing any dangerous materials
	违规制造, 销售枪支	violating the regulations on manufacturing or selling guns
	非法持有, 私藏枪支, 弹药	illegally possessing or concealing any guns or ammunition
	非法出租, 出借枪支	illegally leasing or loaning guns
	丢失枪支不报	failing to report about the lost guns
	非法携带枪支, 弹药, 管制刀具, 危险物品危及公共安全	illegally entering a public place with any gun, ammunition, controlled cutting tool or any other dangerous tools and thereby endangering public security
2 Traffic felony	交通肇事	violating regulations governing traffic and transportation and thereby causing a serious accident
	危险驾驶	driving dangerously
3 Violence	暴力危及飞行安全	using violence against any person on board an aircraft and thereby endangers air safety
	抗税	refusing to pay taxes by means of violence or threat
	强迫交易	buying or selling commodities by violence or intimidation
	强奸	raping a woman or a child by violence, coercion or any other means
	猥亵	acting indecently against a woman or a child by violence, coercion or any other forcible means
	侮辱	publicly humiliating another person by violence or other methods
	暴力干涉婚姻自由	using violence to interfere with another person's freedom of marriage
	妨害公务	obstructing a functionary of a state organ from carrying out his functions by means of violence or threat
	妨害作证	coercing the witness by means of violence or threat
	强迫卖血	forcing another person to sell blood by means of violence or threat
	武装叛乱, 暴乱	organizing or carrying out armed rebellion or armed riot
	强制	forcing by means of violence or threat
	绑架	kidnapping
	殴打	beating
	聚众扰乱	gathering people to disturb public order

Types	Chinese	English
	聚众斗殴	gathering people to engage in affrays
	劫夺被押解人员	rescuing the criminal, defendant or criminal suspect under escort
	暴动越狱	instigating a riot to escape from prison
	聚众持械劫狱	gathering people to raid a prison with weapons
	爆炸罪	causing explosion
	放火	arson
	故意杀人	intentionally committing homicide
	故意伤害	intentionally inflicting injury upon another person
	恐怖组织	terrorist organization
	恐怖活动	terrorist activities
	恐怖主义	terrorism
	极端主义	extremism
	武装掩护走私	shielding smuggling with arms
	抗拒缉私	resisting the seizure of smuggled goods by means of violence or threat
	非法拘禁	unlawfully detaining another person
	拐卖妇女	abducting and trafficking in a woman
	拐卖儿童	abducting and trafficking in a child
	收买被拐卖的妇女	buying an abducted woman
	收买被拐卖的儿童	buying an abducted child
	聚众阻碍解救被收买的妇女	gathering people to prevent functionaries of a state organ from rescuing a sold woman
	聚众阻碍解救被收买的儿童	gathering people to prevent functionaries of a state organ from rescuing a sold child
	劫持航空器	hijacking an aircraft
	劫持船只	hijacking a ship
	劫持汽车	hijacking a motor
	过失致人死亡	negligently causing death to another person
	非法搜查	unlawfully subjecting another person to a body search or a search of his residence
	非法侵入住宅	unlawfully intruding into another person's residence
	诽谤	inventing stories to defame another person by violence or other methods
	刑讯逼供	extorting confession from a criminal suspect or defendant by torture
	暴力取证	extorting testimony from a witness by violence
	虐待	abuse
	煽动暴力抗拒法律实施	incites people to resist by violence the implementation of the laws and administrative rules and regulations of the state
	寻衅滋事	creating disturbances
	组织, 领导, 参加黑社会组织	forming, leading or taking an active part in organizations in the nature of criminal syndicate
	非法集会, 游行, 示威	illegally holding an assembly, a procession or a demonstration
	强迫劳动	compelling employees to work by restricting their personal freedom in violation of the laws and regulations on labour administration
	雇用童工从事危重劳动	hiring child labor to engaging in dangerous or hard work
	报复陷害	retaliation or circumvention
4 Robbery	抢劫	robbing public or private property
	抢夺	forcibly seizing public or private property
	聚众哄抢	gathering people to forcibly seize public or private property
5 Stealing	盗窃	stealing a relatively large amount of public or private property or committing theft repeatedly
	盗掘	excavating a site of ancient culture or ancient tomb of historical, artistic or scientific value
	盗伐	stealthily felling trees, bamboo, etc. in forest or woods
6 Defraudation	诈骗	swindling public or private property
7 Extortion	敲诈勒索	extorting public or private money or property by blackmail
8 Drugs	毒品	drugs related
9 Prostitution	聚众淫乱	gathering to engage in licentious activities
	组织卖淫	arranging for another to engage in prostitution
	强迫卖淫	forcing another person to engage in prostitution
	引诱, 容留, 介绍卖淫	luring other persons into or sheltering prostitution or procuring other persons to engage in prostitution
	引诱幼女卖淫	luring a girl under the age of 14 to engage in prostitution

Types	Chinese	English
	卖淫, 嫖娼	prostitution
	传播性病	spreading serious venereal diseases such as syphilis and gonorrhea
	淫秽	pornography
10 Gambling	赌博	gambling
11 Counterfeiting	生产, 销售伪劣产品	producing or selling fake products
	生产, 销售假药	producing or selling fake medicines
	生产, 销售劣药	producing or selling medicines of inferior quality
	生产, 销售不符合安全标准的食品	producing or selling food that is not up to hygiene standards
	生产, 销售有毒, 有害食品	producing or selling food with toxic or harmful non-food raw materials
	生产, 销售不符合标准的医用器材	producing or selling medical apparatus and instruments or medical hygiene materials that are not up to the national or trade standards
	生产, 销售不符合安全标准的产品	producing or selling products that are not up to the national or trade standards
	生产, 销售伪劣农药, 兽药, 化肥, 种子	producing or selling fake pesticides, fake animal pharmaceuticals or fake chemical fertilizers
	生产, 销售不符合卫生标准的化妆品	producing or selling cosmetics that are not up to hygiene standards
12 IP infringement	假冒注册商标	using a trademark which is identical with the registered trademark on the same kind of commodities without permission
	销售假冒注册商标的商品	selling commodities bearing counterfeit registered trademarks
	非法制造, 销售非法制造的注册商标标识	making or selling representations of the registered trademarks without authorization
	假冒专利	counterfeiting the patent of another
	侵犯著作权	infringing on copyright
	销售侵权复制品	selling works reproduced by infringing on the copyright of the owners
	侵犯商业秘密	infringing on business secrets
	侵犯知识产权	infringing on intellectual property
	损害商业信誉, 商品声誉	fabricating stories and spreading them to damage another person's business credit or commodity reputation
	虚假广告	fake advertisement
	串通投标	bid in collusion
	组织, 领导传销活动	organizing or leading pyramid scheme
	非法经营	illegal operation
	伪造, 倒卖伪造的有价票证	counterfeiting or scalping any negotiable tickets
	非法转让, 倒卖土地使用权	illegally transferring or scalping land-use right
	提供虚假证明文件	deliberately providing false testifying papers
	逃避商检	evading commodity inspection
	扰乱市场秩序	disturbing market's order
	破坏社会主义市场经济秩序	disrupting the order of the socialist market economy
13 Finance	伪造货币	counterfeiting currencies
	假币	counterfeit currencies
	变造货币	altering currencies
	擅自设立金融机构	establishing a banking institution without the approval of the People's Bank of China
	伪造, 变造, 转让金融机构经营许可证, 批准文件	forging, altering or transferring the permit for operation of any banking institution
	高利转贷	fraudulently obtaining credit funds from a banking institution and transferring the funds to another at usury
	骗取贷款, 票据承兑, 金融票证	fraudulently obtaining loans, bill acceptance, financial securities
	非法吸收公众存款	illegally taking in deposits from the general public
	伪造, 变造金融票证	forging or altering financial bills
	妨害信用卡管理	hindering the management of credit card
	伪造, 变造国家有价证券	forging or altering treasury certificates or any other negotiable securities issued by the state
	伪造, 变造股票, 公司, 企业债券	forging or altering stocks or corporate or enterprise bonds
	擅自发行股票, 公司, 企业债券	issuing stocks or corporate or enterprise bonds without approval
	内幕交易, 泄露内幕信息	possessing inside information about any stock exchange transactions or illegally releasing such information before publication
	利用未公开信息交易	using undisclosed information in transactions
	编造并传播证券, 期货交易虚假信息	fabricating and spreading false information to adversely affect securities exchange
	诱骗投资者买卖证券, 期货合约	cajoling investors into buying or selling securities

Types	Chinese	English
	操纵证券, 期货市场	rigging stock prices
	背信运用受托财产	using entrusted property in breach of trust
	违法运用资金	illegally using funds
	违法发放贷款	illegally granting fiduciary loans
	吸收客户资金不入账	illegally lending the funds he absorbed from the clients instead of entering them into the account book
	违规出具金融票证	illegally issuing letters of credit or other letters of guaranty, negotiable instruments, deposit certificates or certificates of financial standing
	对违法票据承兑, 付款, 保证	accepting, paying or guaranteeing an illegal negotiable instrument
	逃汇	illegally transferring foreign exchange inside China out
	洗钱	money laundering
14 Bribery	贪污	corruption
	受贿	accepting bribes
	行贿, 贿赂	bribery
	巨额财产来源不明	huge property with unknown source
	隐瞒境外存款	concealing his bank savings outside the territory of China
	私分国有资产	dividing up state-owned assets in secret
	私分罚没财物	dividing up in secret the fines or confiscated property

Table A.2: Summary Statistics for All Variables Used in Regressions

	Obs	Mean	Std	Min	Max
Panel A: Baseline Variables					
Number of total criminal cases per thou. workers	2608	0.444	0.393	0.000	2.330
Number of public-security cases per thou. workers	2608	0.010	0.018	0.000	0.372
Number of traffic cases per thou. workers	2608	0.114	0.130	0.000	1.027
Number of violence cases per thou. workers	2608	0.079	0.068	0.000	0.430
Number of robbery cases per thou. workers	2608	0.010	0.011	0.000	0.088
Number of stealing cases per thou. workers	2608	0.091	0.091	0.000	0.608
Number of defraudation cases per thou. workers	2608	0.023	0.026	0.000	0.236
Number of extortion cases per thou. workers	2608	0.002	0.002	0.000	0.016
Number of drug cases per thou. workers	2608	0.048	0.071	0.000	0.733
Number of yellow cases per thou. workers	2608	0.003	0.005	0.000	0.052
Number of gambling cases per thou. workers	2608	0.010	0.016	0.000	0.162
Number of fake-product cases per thou. workers	2608	0.003	0.006	0.000	0.081
Number of IP cases per thou. workers	2608	0.001	0.002	0.000	0.033
Number of finance cases per thou. workers	2608	0.003	0.005	0.000	0.089
Number of bribery cases per thou. workers	2608	0.009	0.009	0.000	0.078
Export Shock (1000 USD per worker)	2608	0.054	0.459	-6.117	3.374
Export Shock, Bartik IV (1000 USD per worker)	2608	0.192	1.134	-7.009	11.192
Log GDP per capita	2232	0.082	0.081	-0.527	0.593
Log Population	2232	0.004	0.037	-0.433	0.840
Log FDI	2232	0.010	0.859	-7.093	8.419
College-enrolled share of population	2232	0.0004	0.003	-0.031	0.035
Panel B: Economic Outcomes					
Log employment	2320	12.838	0.852	10.487	16.105
Log Manufacturing employment	2320	11.221	1.283	4.220	14.766
Log Service employment	2320	12.151	0.810	8.363	15.734
Log migrant-in	1577	9.295	1.358	6.908	14.327
migrant-in / 100×workers	1630	1.022	1.666	0.000	17.236
Log migrant-out	1616	10.046	1.053	6.908	12.618
migrant-out / 100×workers	1616	1.343	0.974	0.083	6.466
Job creation	1196	0.047	0.036	0.001	0.231
Job destruction	1224	0.074	0.048	0.004	0.331
Log Average wage	2320	10.828	0.299	9.753	12.678
Log Urban disposable income per capita	2264	10.174	0.282	9.366	11.128
Log Manufacturing wage	1600	3.787	0.407	2.391	7.172
Log Service wage	1600	4.114	0.531	2.030	7.217
Number of total labor disputes per thou. workers	2608	0.102	0.143	0.000	1.565
Number of wage-arrears-related disputes per thou. workers	2608	0.039	0.067	0.000	0.900
Number of layoffs-related disputes per thou. workers	2608	0.011	0.019	0.000	0.304
Number of labor service disputes per thou. workers	2608	0.023	0.044	0.000	0.787
Manufacturing employment / Worker	2320	0.240	0.137	0.002	0.813
Service employment / Worker	2320	0.523	0.137	0.078	0.969
Log Industrial output / Worker	1723	13.118	0.726	9.229	15.138
Log Secondary GDP	2304	24.965	0.989	20.713	27.627
Log Tertiary GDP	2304	24.793	1.038	22.068	28.529
Log Number of new firms (measure 1)	2261	9.307	1.036	4.977	12.783
Log Number of new manufacturing firms (measure 1)	2261	6.521	1.260	2.565	10.220
Log Number of new service firms (measure 1)	2261	9.073	1.072	4.564	12.696
Log Number of new firms (measure 2)	2261	9.374	1.032	5.004	12.875
Log Number of new manufacturing firms (measure 2)	2261	6.608	1.255	2.708	10.273
Log Number of new service firms (measure 2)	2261	9.143	1.064	4.605	12.786
Log Fiscal revenue	2030	23.183	1.048	20.223	27.290
Log Fiscal expenditure	2030	24.077	0.730	21.397	27.451
Fiscal expenditure on stability measures (in 10000RMB) / Worker	1268	0.860	0.551	0.278	7.838
Fiscal expenditure on public security (in 10000RMB) / Worker	1743	0.067	0.047	0.016	0.697
Fiscal expenditure on social spending (in 10000RMB) / Worker	1296	0.797	0.503	0.255	7.141

Notes: The table reports the summary statistics of variables we use in the empirical analysis. We report the number of observations, the average and the standard deviation, and the minimum and the maximum values across prefectures and years. All annual changes are computed relative to the previous year. Panel A lists the variables used in the baseline regressions, while panel B covers those used in the mechanism analysis. The construction and the data sources of the variables in panel B are described in section 5.

Table A.3: Baseline Results: First Stage

Dep. Var.:	ExpShock_{ct}		
	(1)	(2)	(3)
$\text{ExpShock}_{ct}^{ROW}$	0.172***	0.172***	0.193***
	(0.029)	(0.031)	(0.037)
$\triangle\text{Log GDPpc}_{ct}$		0.099	0.254*
		(0.078)	(0.137)
$\triangle\text{Log Population}_{ct}$		0.153	0.065
		(0.358)	(0.218)
$\triangle\text{Log FDI}_{ct}$		-0.006	0.002
		(0.008)	(0.006)
$\triangle\text{College share}_{ct}$		-3.409	-0.150
		(4.005)	(4.167)
City FE	Y	Y	Y
Year FE	Y	Y	N
Prov-year FE	N	N	Y
Observations	2,608	2,232	2,184
R-squared	0.316	0.333	0.419

Notes: This table displays the results from first-stage regressions. Observations are at the city-year level for years from 2011 to 2018. The dependent variable is $ExpShock_{ct}$ constructed according to equation (1). The main explanatory variable is the Bartik IV $ExpShock_{ct}^{ROW}$ from equation (3). Additional time-varying city-level controls in columns (2) and (3) are constructed as the change between year t and $t-1$. All control variables are in logs except for the college share. We include city fixed effects and year fixed effects in columns (1) and (2), and we replace year fixed effects with the province-year fixed effects in column (3). Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Summary Statistics for Different Types of Crime

Crime Type	Number	Percentage
Public security	65348	1.83%
Traffic	875747	24.53%
Violence	637746	17.86%
Robbery	82617	2.31%
Stealing	778661	21.81%
Defraudation	188256	5.27%
Extortion	19144	0.54%
Drugs	374108	10.48%
Prostitution	27003	0.76%
Gambling	85472	2.39%
Counterfeiting	33091	0.93%
Intellectual property	13970	0.39%
Finance	25287	0.71%
Bribery	59853	1.68%

Notes: The table lists the number and share of different types of criminal cases in our sample. We consider 14 categories of criminal cases by matching the keywords in the case titles. The full list of keywords we use and their translations are reported in Table A.1. The shares does not add up to 100% since (1) there is a left out category ("other") with cases whose key information in their titles and content is missing; (2) some cases involve multiple offenses. The "Other" category accounts for 6.9% of the total cases.

Table A.5: Robustness: Basic Checks

Dep. Var.:	Criminal cases per thousand$_{ct}$		
	(1) 2014-2018 sample	(2) Region-year FE	(3) Drop one prov. at a time
ExpShock$_{ct}$	-0.082***	-0.080***	
	(0.026)	(0.024)	
Min ExpShock$_{ct}$ coef.			-0.094***
			(0.025)
Max ExpShock$_{ct}$ coef.			-0.125***
			(0.029)
City FE	Y	Y	Y
Year FE	Y	N	Y
Region-year FE	N	Y	N
First-stage F-stat	23.75	33.82	-
Observations	1,630	2,608	-

Notes: Observations are at the city-year level. The dependent variable is the CJO-recorded criminal cases per thousand working-age population in year t. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. Column (1) uses the sample from 2014 to 2018. Column (2) uses region-year instead of year fixed effects. Column (3) shows the smallest and largest export shock coefficients from regressions where we drop one province at a time. All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.6: Robustness: Control for Other City-Level Shocks

Dep. Var.:	Criminal cases per thousand$_{ct}$				
	(1) Domestic absorption shocks	(2) Domestic output shocks	(3) Domestic absorption & output shocks	(4) Domestic import shocks	(5) Spatial correlation
ExpShock$_{ct}$	-0.125***	-0.124***	-0.118***	-0.131***	-0.070***
	(0.035)	(0.035)	(0.034)	(0.036)	(0.024)
AbsorptionShock$_{ct}$	-0.002**		0.033***		
	(0.001)		(0.011)		
OutputShock$_{ct}$		-0.002**	-0.036***		
		(0.001)	(0.012)		
ImportShock$_{ct}$				-0.011	
				(0.017)	
Neighboring ExpShock$_{ct}$					-0.165***
					(0.046)
City FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
First-stage F-stat	27.96	27.89	27.01	27.41	29.20
Observations	1,950	1,950	1,950	1,950	2,264

Notes: Observations are at the city-year level for years from 2011 to 2018. The dependent variable is the CJO-recorded criminal cases per thousand working-age population in year t. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. The city-level absorption, output, and import shocks in columns (1) to (4) are constructed according to equations (4), (5) and (6) (in 1,000,000RMB). Column (5) displays the results when we control for a weighted-average export shock measure in neighboring cities. All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.7: Robustness: Balance Test of Product-level Shocks

	(1) Coef.	(2) SE
Predetermined City Characteristics:		
Share of college educated (%)	0.364	(0.348)
Manufacturing employment share (%)	-0.039	(0.038)
Export to GDP ratio (%)	-0.078	(0.099)
Share of population without Hukou (%)	-0.047	(0.036)
Log GDP per capita	-0.016	(0.011)
Log fiscal expenditure per capita	-0.004	(0.003)
Criminal cases per thousand in 2010	-0.001	(0.001)
Joint significance test: χ^2=0.70, p-value=0.6732		

Notes: The table reports coefficients and standard errors from regressing HS6 product-level export shocks on each product-specific weighted average of initial city characteristic (pre-trend in outcome) and year fixed effects. All regressions are weighted by the simple average of the exposure to HS6 product-level shock across cities. Standard errors are clustered at the 2-digit HS level. Coefficients are multiplied by 1000 for readability.

Table A.8: Robustness: Rotemberg Weights

HS 6-digit	Product description	Weight
847130	Panel computer, other portable automatic data processing machines	0.043
851712	Walkie-talkie, cordless phone (including car cordless phones), and other telephones for cellular networks or for other wireless networks	0.026
851770	Parts of digital program-controlled telephonic or telegraphic switching apparatus, parts of optical line terminal equipments and pulse code modulation equipments, parts of wireless telephones hand-sets, parts of walkie-talkie and Laser transmitting and receiving unit of optical communication equipment	0.026
901380	Hand magnifying glasses, "Door eyes" and other liquid crystal display panel	0.020
852872	Color digital (analogue) television receivers, (of plasma)	0.013
	Top five Rotemberg weights as a share of positive weight:	12.2%

Notes: The table reports the five HS 6-digit products with the highest Rotemberg weights for $ExpShock_{ct}^{ROW}$ and the share of these top five Rotemberg weights in the total positive weight.

Table A.9: Classification for HS Sections

HS section	Range of HS 2-digit
Animal & Animal Products	01 - 05
Vegetable Products	06 - 14
Foodstuffs	15 - 24
Mineral Products	25 - 27
Chemicals & Allied Industries	28 - 38
Plastics & Rubbers	39 - 40
Raw Hides, Skins, Leather & Furs	41 - 43
Wood & Wood Products	44 - 49
Textile	50 - 63
Footwear & Headgear	64 - 67
Stone & Glass	68 - 71
Metals	72 - 83
Machinery & Electrical	84 - 85 and 90 - 92
Transportation	86 - 89
Miscellaneous	93 - 99

Notes: The table lists HS sections and the corresponding range of HS 2-digit.

Table A.10: Robustness: The exogeneity of the shares

Dep. Var.:	Criminal cases per thousand$_{ct}$		
	(1)	(2)	(3)
	Drop one HS at a time	Pre-trend test	Destination-specific demand shocks
Min ExpShock$_{ct}$ coef.	-0.081**		
	(0.034)		
Max ExpShock$_{ct}$ coef.	-0.118***		
	(0.030)		
ExpShock$_{ct+2}$		0.021	
		(0.019)	
ExpShock$_{ct}$			-0.115***
			(0.035)
City FE	Y	Y	Y
Year FE	Y	Y	Y
First-stage F-stat	-	19.20	43.17
Observations	-	2,282	2,608

Notes: Observations are at the city-year level for years from 2011 to 2018. The dependent variables are the CJO-recorded criminal cases per thousand working-age population in year t. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. Column (1) reports the smallest and largest export shock coefficients from regressions where we drop one HS section at a time. Column (2) examines whether the time-$(t+2)$ export shock has explanatory power for crime rate in year t. Column (3) instrument for $ExpShock_{ct}$ with an alternative Bartik IV using variations of demand shocks across destinations as described in (8). All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.11: Robustness: Controlling for Time Varying Effects of the "Incomplete Share"

Dep. Var.:	Criminal cases per thousand$_{ct}$	
	(1)	(2)
	Controlling for initial export exposure × year FEs	Controlling for terciles of initial export exposure × year FEs
	Panel A: IV Specification	
ExpShock$_{ct}$	-0.093**	-0.103***
	(0.038)	(0.033)
First-stage F-stat	26.52	25.95
Observations	2,608	2,608
	Panel B: Reduced-form Specification	
ExpShock$_{ct}$	-0.016***	-0.017***
	(0.006)	(0.005)
R-squared	0.847	0.848
Observations	2,608	2,608
City FE	Y	Y
Year FE	Y	Y

Notes: Observations are at the city-year level. The dependent variable is the CJO-recorded criminal cases per thousand working-age population in year t. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. Column (1) controls for initial export exposure per worker interacted with year fixed effects, while column (2) controls for initial export exposure tercile dummies interacted with year fixed effects. Panel A is IV specification, while panel B is reduced-form regressions. Both columns include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered at the city level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.12: Robustness: Alternative Statistical Inference

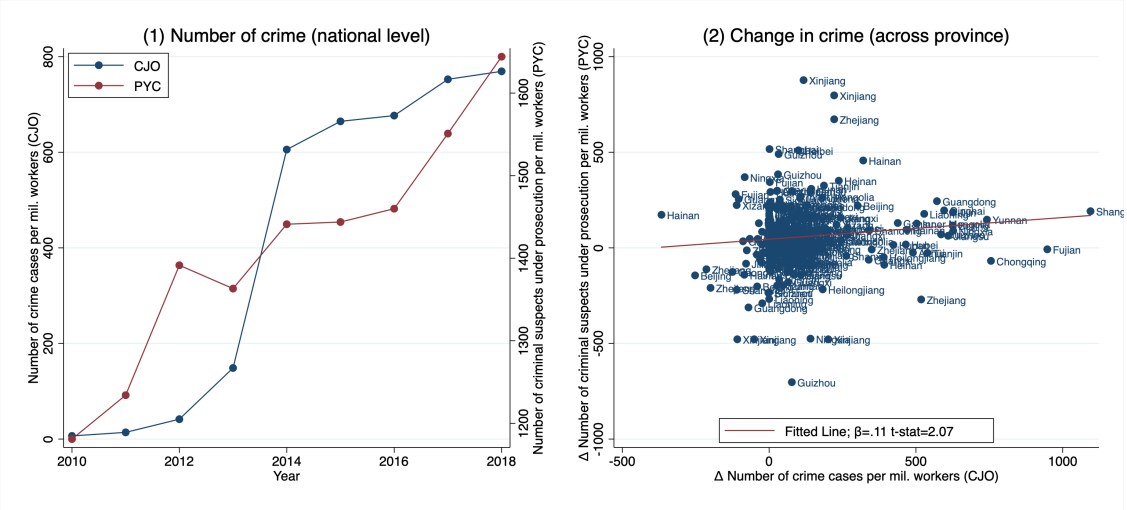
Dep. Var.:	Criminal cases per thousand$_{ct}$				
	(1) Province level	(2) Export similarity	(3) Export similarity: outside prov.	(4) Two-way: Prov. + Export similarity	(5) Two-way: Prov. + Export similarity outside prov.
ExpShock$_{ct}$	-0.110***	-0.110***	-0.110***	-0.110***	-0.110***
	(0.029)	(0.030)	(0.024)	(0.029)	(0.025)
City FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
First-stage F-stat	61.01	34.43	21.52	43.40	39.47
Observations	2,608	2,608	2,608	2,608	2,608

Notes: Observations are at the city-year level for years from 2011 to 2018. The dependent variable is the CJO-recorded criminal cases per thousand working-age population in year t. The main explanatory variable $ExpShock_{ct}$ and the Bartik IV $ExpShock_{ct}^{ROW}$ are constructed according to equations (1) and (3), respectively. All columns report IV estimates, which include city- and year-fixed effects. Robust standard errors are reported in parentheses and are clustered as described in each respective penal. *** p<0.01, ** p<0.05, * p<0.1.

Table A.13: Keywords for Identifying Labor Disputes

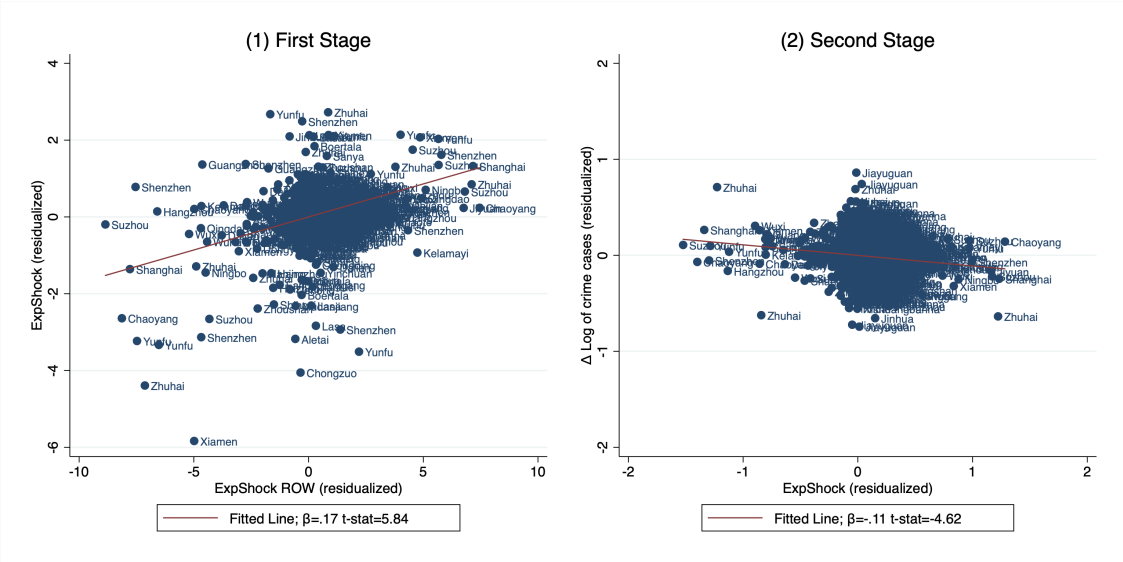
Types	Chinese	English
1 Wage-arrears related disputes	追索劳动报酬	claims for labor remuneration in arrear
	工资, 工钱, 薪酬, 十三薪	wage
2 Layoffs-related disputes	确认劳动关系	acknowledgement of labor relations
	辞职, 离职, 辞退, 解聘	resignation, dismissal
	聘用, 聘任	appointment, employment
	经济补偿金	economic compensation
	失业金, 失业保险	unemployment compensation, unemployment insurance benefits
3 Other labor disputes	竞业限制	non-competition clause
	社会保险	social insurance
	养老保险, 养老金	endowment insurance, pensioin
	工伤保险	insurance benefits for work-related injuries
	医疗保险	medical expenses and medical insurance benefits
	生育保险	maternity insurance benefits
	人事	personnel
	集体合同	collective labor contracts
	劳务派遣	labor dispatching contracts
	福利待遇	welfare benefits
4 Labor service contract disputes	劳务合同	labor services contracts

Figure A.1: Compare crime recorded on CJO versus PYC



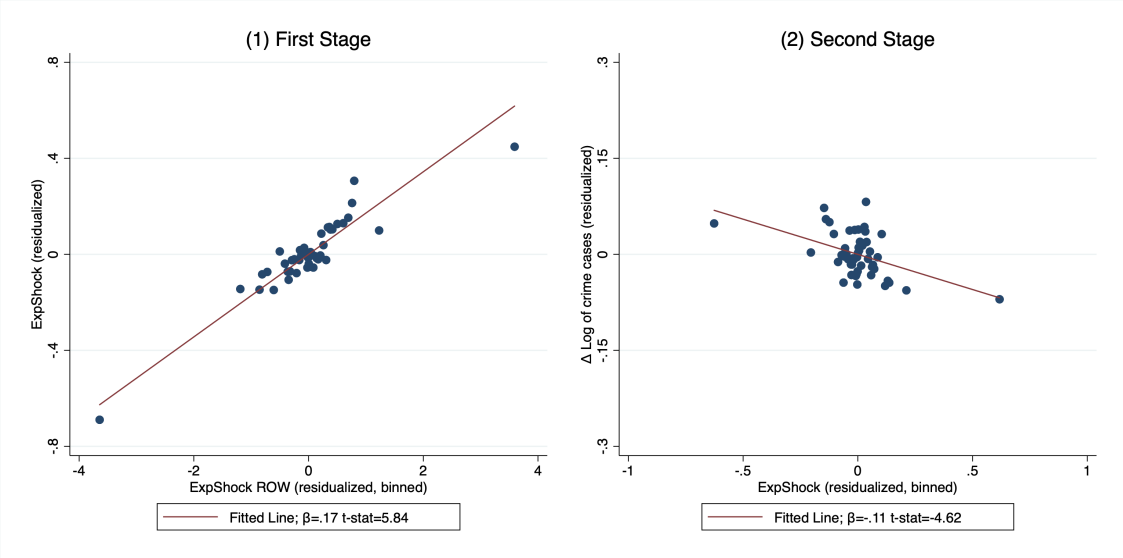
Notes: The figure compares the crime rates computed from the CJO database and China Procuratorial Yearbook (PYC) published by Supreme People's Procuratorate. The CJO crime rates are measured as the number of criminal cases per million working-age people. The PYC crime rates are proxied by the number of criminal suspects under prosecution per million workers. The top panel presents the national trends of both indicators. The bottom panel displays the correlation between the change in the province-specific crime rates from 2011 and 2018, where the change is computed as the difference between t and $t-1$.

Figure A.2: Residual Scatterplot: City Export Shocks and Crime



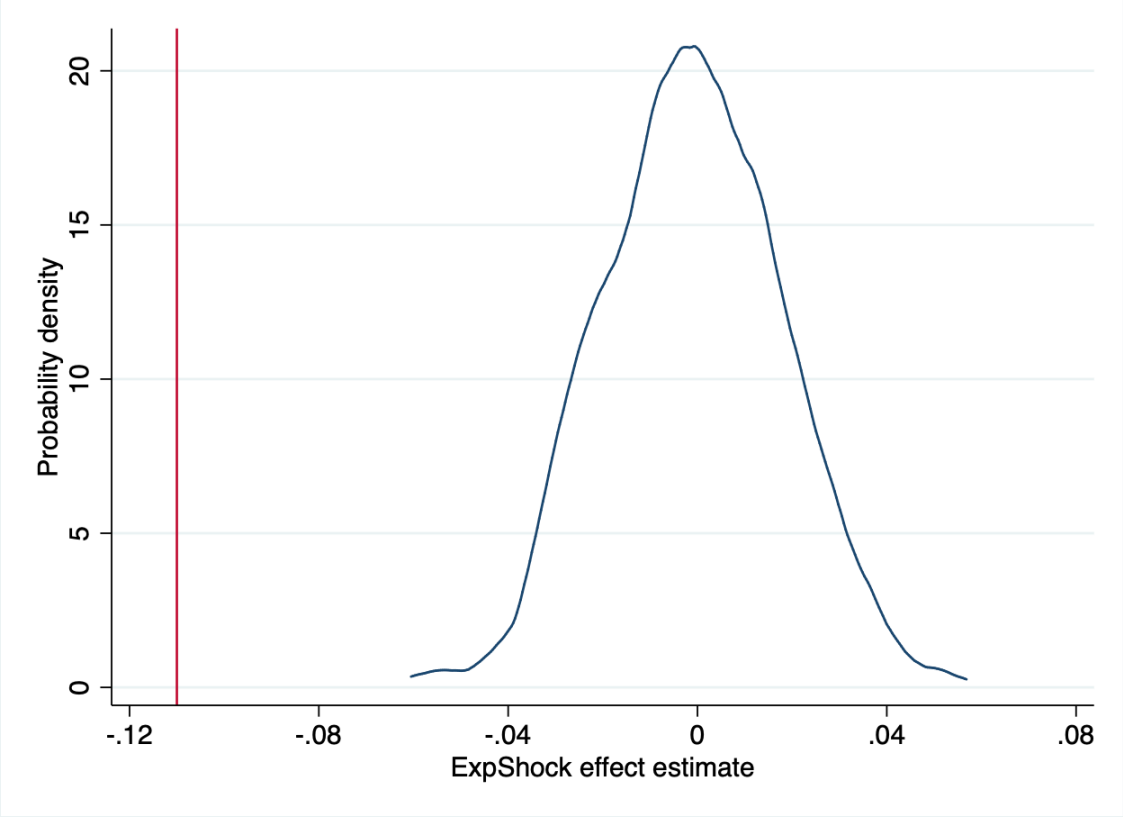
Notes: The figure presents the residual scatter plots based on the specification reported in column (2) of Table 2. Figure (1) presents the results from the first stage of IV regression. The horizontal and vertical variables are obtained by regressing the $ExpShock_{ct}^{ROW}$ and $ExpShock_{ct}$ against the variables in the right hand side of equation (2) excluding $ExpShock_{ct}$, respectively. Figure (2) presents the results from the second stage of IV regressions. The horizontal variables are obtained by regressing the predicted export shocks from first stage regression against the variables on the right hand side of the equation (2) excluding $ExpShock_{ct}$. The vertical variables are constructed similarly by regressing the changes in the number of CJO-recorded criminal cases per 10 thousand workers against the right-hand side variables in equation (2) excluding $ExpShock_{ct}$.

Figure A.3: Binned Residual Scatterplots: City Export Shocks and Crime



Notes: The figure presents the residual binned scatter plots based on the specification reported in column (2) of Table 2. Figure (1) presents the results from the first stage of IV regression. The horizontal and vertical variables are obtained by regressing the $ExpShock_{ct}^{ROW}$ and $ExpShock_{ct}$ against the variables on the right hand side of equation (2) excluding $ExpShock_{ct}$, respectively. Figure (2) presents the results from the second stage of IV regressions. The horizontal variables are obtained by regressing the predicted export shocks from first-stage regression against the variables on the right-hand side of the equation (2) excluding $ExpShock_{ct}$. The vertical variables are constructed similarly by regressing the changes in the number of CJO-recorded criminal cases per 10 thousand workers against the right-hand side variables in equation (2) excluding $ExpShock_{ct}$. City-level observations are grouped into 50 bins based on their residual export shock.

Figure A.4: Distribution of Estimated Coefficients in the Falsification Test



Notes: The figure shows the cumulative distribution density of the estimated coefficients from 500 simulations randomly assigning *ExpShock* to cities. The vertical line presenting the estimate of column (2) in Table 2.

B Background: Legal System in China

In this section, we introduce briefly how the legal proceedings work in dealing with a criminal case in China to help readers better understand the institutional background of the database we use.

According to the Criminal Procedure Law of the People's Republic of China, three institutions participate in handling a criminal case: the public security organs, the People's Procuratorates, and the People's Courts. The public security organs are responsible for the investigation, detention, execution of arrests, and preliminary inquiry. The People's Procuratorates focus mainly on procuratorial work and initiating public prosecution. The main duty of People's Courts is adjudication. Different levels of people's courts have jurisdiction rights over different criminal cases as courts of the first instance. A primary People's Court deals with ordinary criminal cases, while an intermediate People's Court is responsible for the cases endangering national security or those punishable by life imprisonment or the death penalty. The Higher People's Courts and the Supreme People's Court shall have jurisdiction as courts of the first instance over major criminal cases pertaining to an entire province and the whole nation, respectively.

In general, a public-prosecution criminal case should go through three stages: (i) filing and investigation, (ii) examination and prosecution, and (iii) trial. First, the public security organs or the People's Procuratorates should decide whether to file a case after promptly examining the materials provided by a reporter or informant. Then, for a criminal case that has been filed, the public security organ shall carry out an investigation, collecting and obtaining evidence to prove the criminal suspect guilty or innocent or to prove the crime to be minor or grave. Active criminals or primary suspects can be detained during the investigation process or even be arrested. Suppose the public security organ wishes to arrest a criminal suspect. In that case, it should submit a written request together with the case file and evidence to the People's Procuratorate for approval of arrest within three days after the detention.[39] The People's Procuratorate should decide to arrest within seven days from receiving the arrest application. The time limit for holding a criminal suspect in custody during an investigation after arrest should not exceed two months except for some complex cases.[40] After the public security organ has concluded its investigation, the case,

[39] In special circumstances, the time limit for submitting an arrest request may be extended by one to four days. As to the arrest of a primary suspect who involved in crimes committed from one place to another, repeatedly, or in a gang, the time limit may be extended to 30 days.

[40] If the case is complex and the investigation cannot be concluded within the basic time limit, an extension of one month may be allowed with the approval of the People's Procuratorate at the next higher level. Besides, for some particularly grave and complex cases, a further 2 to 4 months extension can be allowed under the approval of the Standing Committee of the National People's Congress.

together with a written recommendation for prosecution and all evidence, would be sent to the People's Procuratorate for further examination. The People's Procuratorate should make a decision within one month on whether to initiate a prosecution at People's Courts.[41] When the People's Procuratorate considers that the evidence is reliable and sufficient and that the criminal responsibility shall be investigated, it would decide to initiate a prosecution. However, the offender will not be given criminal punishment and the People's Procuratorate shall not initiate a prosecution if a criminal suspect is found to be under one of the following circumstances: (i) the act is obviously minor, causing no serious harm, and is therefore not deemed a crime; (ii) the limitation period for criminal prosecution has expired; (iii) an exemption of criminal punishment has been granted in a special amnesty decree; (iv) the crime is to be handled only upon complaint according to the Criminal Law, but there has been no complaint, or the complaint has been withdrawn; (v) the criminal suspect is deceased; or (vi) other laws provide an exemption from the investigation of criminal responsibility. Finally, the People's Court should open the court session and try the case for no more than three months at the latest.[42] Thus, according to the procedure described above, our sample covers the cases in which the People's Procuratorate decides to initiate a public prosecution in the People's Courts and those of private prosecution, in which case the victim has the right to sue directly to a People's Court.[43]

C Data Appendix

Judgement Documents from China Judgments Online

The data on the number of criminal cases are from China Judgments Online (CJO), available at https://wenshu.court.gov.cn. In response to the reform of the Chinese judicial system under Xi Jinping to increase the judicial justice, the Supreme People's Court (SPC) issued a new regulation ("Provisions on the Online Issuance of Judgment Documents by People's Courts") on November 13, 2013, for the establishment of CJO. The 2013 Regulations, which were revised in July 2016, specify which judgment documents made by all levels of people's courts should be released online and which should not.[44] According to these regulations, the CJO covers the following types of judgment documents: (i) criminal, civil,

[41] An extension of a half month may be allowed for major or complex cases.

[42] If it is necessary to extend the time limit, the period shall not exceed six months.

[43] Cases of private prosecution include (i) cases to be handled only upon complaint, (ii) minor criminal cases, and (iii) cases for which the victims have evidence to prove that the defendants have criminal responsibility whereas the public security organs or the People's Procuratorates do not investigate.

[44] Detailed information on these two regulations can be found in "Provisions on the Online Issuance of Judgment Documents by People's Courts", officially referred to as Fa shi [2013] No.26 (effective since January 1, 2014), and Fa shi [2016] No.19 (effective since October 1, 2016).

and administrative judgments, (ii) criminal, civil, administrative, and enforcement rulings, (iii) payment orders; (iv) notices rejecting appeal petitions in criminal, civil, administrative, and enforcement cases, (v) state compensation decisions, (vi) compulsory medical treatment decisions or decisions denying compulsory medical treatment applications, (vii) decisions enforcing or modifying criminal punishment, (viii) decisions on detention or fines made against acts that obstruct litigation or enforcement, decisions of early release from custody, or reconsideration decisions made in response to application for reconsideration of detentions, fines, or other decisions on sanctions, (ix) administrative mediation documents, civil public interest litigation mediation documents, and (x) other judgment documents which have the effect of suspending or terminating litigation procedures. In our empirical analysis, we only use criminal judgments to calculate city crime rates in order to avoid double-counting cases to the greatest extent since a criminal case may produce multiple judicial documents but only one judgment.

China Customs Database

Information on city exports is derived from the China Customs Database, which covers the universe of Chinese exports and imports, and was harmonized and generously provided by Tsinghua University. The data reports the annual trade information on values, quantities, and partner countries at the HS 8-digit level for all Chinese cities in the period under investigation (i.e., 2010 to 2018).

China Procuratorial Yearbook

The number of criminal suspects under public prosecution comes from China Procuratorial Yearbook (PYC), which contains the annual work reports given by the Supreme People's Procuratorate and the People's Procuratorates at the province level. PYC records the number of criminal suspects authorized to arrest or under prosecution for each province from 2010 to 2018.

China City and China Industrial Statistical Yearbooks

The data on city-level time-varying controls, e.g., GDP per capita, FDI, and other economic indicators, e.g., manufacturing and service employment and industry-level output in the analysis, come from the City and Industrial Statistical Yearbooks of China (various issues from 2010 to 2016). The City and Industrial Statistical Yearbooks of China are compiled by the National Bureau of Statistics of China and have been widely used for studying social and economic development at the prefecture city level.

Fiscal, Provincial and City Statistical Yearbooks

The detailed fiscal expenditure structure data for each city from 2011 to 2018 comes from Fiscal Statistical Yearbooks published by provincial Bureaus of Finance, Statistical Yearbooks published by provincial Bureaus of Statistics, and Statistical Yearbooks published by Bureaus of Statistics of each city. These yearbooks provide detailed measures of local social and economic indices, which are not available in the National Statistical Yearbooks.

China Population Census Data

We use the 2010 Population Census and One-percent Population Census of 2015 for information on the working-age population, young share, and migration flows. Notably, the 2015 census is the latest data with restricted public access. These censuses provide detailed information on individuals' demographic and economic characteristics, such as the education levels, employment status, hukou location, and current residential city.

To trace migration flows across Chinese cities, we leverage the answers to the question "How long have you been away from your Hukou city?" in the survey and identify the year of migration for each migrant. We identify the year of migration between 2011 and 2015 using the 2015 1% Population Census. Following Imbert et al. (2022), we only include migrants who were 15 to 64 years at the time of migration to exclude migrants who migrated to study. The overall migration inflow of city d in year t is calculated by summing up migrants from all other cities in that year, namely, $Migrant_{dt}^{IN} = \Sigma_o L_{odt}$, where L_{odt} denotes the migration flow from city o to city d in year t. The overall migration outflow of city o in year t is computed by aggregating migrants to all other cities in that year, namely, $Migrant_{ot}^{OUT} = \Sigma_d L_{odt}$. We use two variables to measure city-level migration: (i) the logarithmic migration flows, and (ii) migration flows per hundred working-age population in 2010.

National Tax Survey

The data on the average wage in manufacturing and service sectors comes from the National Tax Survey between 2010 and 2015. The survey conducted by the Chinese Ministry of Finance and State Administration of Taxation covers around 700 thousand sample companies each year covering all sectors. It provides detailed information on firms' production and operations, fixed assets investment, taxes, the financial situation, and employment.

China Administrative Firm Registration Database

The data on the number of new firms comes from China Administrative Firm Registration Database. This database is collected by the State Administration of Industry and

Commerce and lists registration information of all firms in China starting in 1980, including firm name, registration number, date of establishment, address, ownership, registered capital, and related legal persons.

D Measuring Job Creation and Destruction

We construct job flows measures following Davis and Haltiwanger (1992) based on firm level employment information from 2012 - 2015 National Tax Survey collected by Chinese Ministry of Finance and State Administration of Taxation. Let g_{et} and e_t denote the job growth rate of an establishment e and its employment at time t, respectively:

$$g_{et} = \begin{cases} 2(e_t - e_{t-1})/(e_t + e_{t-1}) & \text{if } e_{t-1}, e_t > 0 \\ -2 & \text{if } e_{t-1} > 0, e_t = 0 \\ 2 & \text{if } e_{t-1} = 0, e_t > 0 \end{cases}$$

where the first equation represents the job growth rate for continuing establishments, which is within the range (-2,2); the second and third equations represent the job growth rate for existing and entering firms, respectively. Since the National Tax Survey data is a survey that covers around 700 thousand companies each year spreading across all sectors, it doesn't reveal information on firm's operating status, making it challenging to identify existing and entering firms precisely. Therefore, we only keep the continuing establishments during the sample period. In practice, we compute the gross job creation rate (job destruction rate) of city c at time t as the ratio between the sum of employment gains (loss) in absolute terms of expanding (shrinking) establishments within the city, and the city's total employment X_{ct} :

$$JC_{ct} = \sum_{e \in E_{ct}, g_{et} > 0} \left(\frac{x_{et}}{X_{ct}} \right) g_{et} = \frac{\Sigma_{e \in E_{ct}, g_{et} > 0} (e_t - e_{t-1})}{X_{ct}}$$

and

$$JD_{ct} = \sum_{e \in E_{ct}, g_{et} < 0} \left(\frac{x_{et}}{X_{ct}} \right) |g_{et}| = \frac{\Sigma_{e \in E_{ct}, g_{et} < 0} (e_{t-1} - e_t)}{X_{ct}}$$

where $x_{et} = \frac{e_t + e_{t-1}}{2}$.

E Model Appendix

E.1 Solving the Model

Though the model is static by nature, it is convenient to think of it as unfolding in three sub-periods. In the first sub-period, citizens make occupation choices after observing their innate ability and the return to each occupation. In the second sub-period, production workers engage in production and earn wages. An entrepreneur invests a fixed cost to open a firm

and earn a profit, where the firm-owner chooses the optimal level of productivity investment, pricing rule, and export decision. Criminals involve resource appropriation activities that produce a redistribution of output from the productive sectors (workers and entrepreneurs) towards the appropriation sector. Finally, all markets clear, and consumption takes place.

Household's Problem

Solving the utility maximization problem of households described in equations (10) gives the demand for each intermediate good:

$$q(\omega) = \left(\frac{p(\omega)}{P}\right)^{-\sigma} \frac{R}{P} \tag{17}$$

where $p(\omega)$ is the price of intermediate good ω, R is the total revenue (expenditure) on final goods, and P denotes the price index of final goods, which takes the form of

$$P = \left(\int_{\omega \in \Omega} p(\omega)^{1-\sigma} d\omega\right)^{\frac{1}{1-\sigma}} \tag{18}$$

Firm's Problem

Solving the profit maximization problem for a non-exporter described in equation (13) given the demand function in equation (17), we can obtain the optimal managerial effort $\varphi^n(a)$, price $p^n(a)$, firm revenue $r^n(a)$ and entrepreneur income $\pi^n(a)$ expressed as:

$$\varphi^n(a) = \frac{\kappa_1}{\lambda} P^{\sigma-1} R a \tag{19}$$

$$p^n(a) = \frac{\sigma}{\sigma-1}\left(\frac{\kappa_1}{\lambda}\right)^{\frac{1}{1-\sigma}} P^{-1} R^{\frac{1}{1-\sigma}} a^{\frac{1}{1-\sigma}} \tag{20}$$

$$r^n(a) = p^n(a) q^n(a) = \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \frac{\kappa_1}{\lambda} P^{2\sigma-2} R^2 a \tag{21}$$

$$\pi^n(a) = (1 - A(L_c)) \frac{\kappa_1^2}{2\lambda} P^{2\sigma-2} R^2 a \tag{22}$$

where $\kappa_1 = (\frac{\sigma}{\sigma-1})^{-\sigma} \frac{1}{\sigma-1}$ is a constant, and the superscript n denotes non-exporter.

Similarly, by solving the profit maximization problem for an exporter described in equa-

tion (13), we can obtain

$$\varphi^e(a) = \frac{\kappa_2}{\lambda} P^{\sigma-1} R a \tag{23}$$

$$p_d^e(a) = \frac{\sigma}{\sigma-1}\left(\frac{\kappa_2}{\lambda}\right)^{\frac{1}{1-\sigma}} P^{-1} R^{\frac{1}{1-\sigma}} a^{\frac{1}{1-\sigma}} \tag{24}$$

$$p_x^e(a) = \frac{\tau\sigma}{\sigma-1}\left(\frac{\kappa_2}{\lambda}\right)^{\frac{1}{1-\sigma}} P^{-1} R^{\frac{1}{1-\sigma}} a^{\frac{1}{1-\sigma}} = \tau p_d^e(a) \tag{25}$$

$$r_d^e(a) = p_d^e(a) q_d^e(a) = \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \frac{\kappa_2}{\lambda} P^{2\sigma-2} R^2 a \tag{26}$$

$$r_x^e(a) = p_x^e(a) q_x^e(a) = \tau^{1-\sigma} r_d^e(a) \tag{27}$$

$$\pi^e(a) = (1 - A(L_c))\left(\frac{\kappa_2^2}{2\lambda} P^{2\sigma-2} R^2 a - f_x\right) \tag{28}$$

where $\kappa_2 = (\frac{\sigma}{\sigma-1})^{-\sigma}\frac{1}{\sigma-1} + (\frac{\tau\sigma}{\sigma-1})^{-\sigma}\frac{\tau}{\sigma-1} = (1+\tau^{1-\sigma})\kappa_1$, the subscripts d and x denote domestic and foreign markets respectively, and the superscript e represents exporter.

Aggregation

To solve for the general equilibrium, we proceed by aggregating the individual variables. Given an individual's innate ability a follows a Pareto distribution with shape parameter θ and $a_{min} = 1$, the total revenue (expenditure) of final goods can be calculated by:

$$\begin{aligned} R &= \int_{a^*}^{a_x^*} r^n(a) g(a) da + \int_{a_x^*}^{\infty} (1+\tau^{1-\sigma}) r_d^e(a) g(a) da \\ &= a^{*-\theta} \frac{2\sigma\theta}{\theta-1} + a_x^{*-\theta} \frac{2\sigma\theta}{\theta-1} f_x, \end{aligned} \tag{29}$$

The total demand for production workers L_d gives the following expression:

$$\begin{aligned} L_d &= \int_{a^*}^{a_x^*} l_p^n(a) g(a) da + \int_{a_x^*}^{\infty} l_p^e(a) g(a) da \\ &= a^{*-\theta} \frac{2\theta(\sigma-1)}{\theta-1} + a_x^{*-\theta} \frac{2\theta(\sigma-1)}{\theta-1} f_x, \end{aligned} \tag{30}$$

The final goods used to productivity investment and fixed export costs R_f satisfy:

$$\begin{aligned} R_f &= \int_{a^*}^{a_x^*} \frac{\kappa_1^2}{2\lambda} P^{2\sigma-2} R^2 a g(a) da + \int_{a_x^*}^{\infty} \left(\frac{\kappa_2^2}{2\lambda} P^{2\sigma-2} R^2 a + f_x\right) g(a) da \\ &= a^{*-\theta} \frac{\theta}{\theta-1} + a_x^{*-\theta} \frac{2\theta-1}{\theta-1} f_x, \end{aligned} \tag{31}$$

Equilibrium

Finally, the equilibrium of this model is characterized by two ability cutoffs a^* and a_x^*, and the mass of criminals in the economy L_c, which can be uncovered under two market-clearing conditions and the relationship between a^* and a_x^*. First, goods market-clearing implies that the aggregate expenditure (consumption and investment) equals the aggregate revenue:

$$\begin{aligned} R &= (1 - A(L_c))L_p + (1 - A(L_c))\Pi + A(L_c)(\Pi + L_p) + R_f \\ &= \Pi + L_p + R_f. \end{aligned} \tag{32}$$

Together with equation (16), we can obtain:

$$R - R_f = \frac{[1 - A(L_c)]L_c}{A(L_c)} \tag{33}$$

Then labor market clearing requires the supply of production workers must meet the demand for them. The sorting of individuals pins down the supply of production labor into occupations. Given the ability distribution assumption, we have the following equation:

$$L_d = G(a^*) - L_c = 1 - a^{*-\theta} - L_c \tag{34}$$

Thus, using the expression for total revenue R in equation (29), labor demand L_d in equation (30) and final goods used for investment R_f in equation (31), the equilibrium system of this model can be described as:

$$a^{*-\theta}\left[\frac{2\theta\sigma - \theta}{\theta - 1} + \frac{2\theta\sigma - 2\theta + 1}{\theta - 1}\eta\right] = \frac{[1 - A(L_c)]L_c}{A(L_c)} \tag{35}$$

$$a^{*-\theta}\left[\frac{2\theta(\sigma - 1)}{\theta - 1} + \frac{2\theta(\sigma - 1)}{\theta - 1}\eta\right] = 1 - a^{*-\theta} - L_c \tag{36}$$

$$a_x^* = \frac{f_x}{2\tau^{1-\sigma} + \tau^{2-2\sigma}}a^* \tag{37}$$

where η is a scalar depending on variable and fixed exporting costs, i.e., $\eta = (2\tau^{1-\sigma} + \tau^{2-2\sigma})^\theta f_x^{1-\theta}$.

Appendix Proposition 1. *Under Assumptions 1 and 2, a unique symmetric equilibrium exists, with a positive mass of households choosing each occupation.*

Besides the one described in Appendix Proposition 1, the economy has two equilibriums, and the other has zero criminals $L_c = 0$. Our analysis focus on the equilibrium in which $L_c > 0$, since the equilibrium with $L_c = 0$ is not in line with reality. The proof is provided

in Appendix E.2.

Appendix Proposition 2. *Under Assumptions 1 and 2, exports slowdown, captured by an increase in τ or f_x, decreases the demand for production workers.*

The proof of Appendix Proposition 2 is provided in E.4.

E.2 Proof of Appendix Proposition 1

Plugging equation (36) into equation (35) and we can obtain:

$$\frac{2\theta\sigma-\theta+(2\theta\sigma-2\theta+1)\eta}{2\theta\sigma-\theta-1+(2\theta\sigma-2\theta)\eta}=\frac{(1-A(L_c))L_c}{A(L_c)(1-L_c)}. \tag{38}$$

We define ζ as the following:

$$\zeta=\frac{2\theta\sigma-\theta+(2\theta\sigma-2\theta+1)\eta}{2\theta\sigma-\theta-1+(2\theta\sigma-2\theta)\eta}>1 \tag{39}$$

where ζ is a constant depending on values of parameters $\{\theta,\sigma\}$ and exogenous variables $\{\tau,f_x\}$. Then equation (38) can be rewritten as:

$$\zeta AL_c^{\alpha}(1-L_c)=(1-AL_c^{\alpha})L_c \tag{40}$$

Let $F(L_c)=\zeta AL_c^{\alpha}(1-L_c)-(1-AL_c^{\alpha})L_c$. One can derive the first and second derivatives with respect to L_c as the following equations:

$$\begin{aligned}F^{'}(L_c) &= \alpha\zeta AL_c^{\alpha-1}+(1-\zeta)(1+\alpha)AL_c^{\alpha}-1\\ F^{''}(L_c) &= \alpha AL_c^{\alpha-2}[(\alpha-1)\zeta+(1-\zeta)(1+\alpha)L_c]\end{aligned}$$

When $\alpha>2\zeta-1$, one can obtain:

$$F^{''}(L_c)>\alpha AL_c^{\alpha-2}[(\alpha-1)\zeta+(1-\zeta)(1+\alpha)]>0$$

where the first inequality comes from $L_c<G(a^*)<1$ and $\zeta>1$. As $F^{''}(L_c)>0$, $F^{'}(L_c)$ is increasing with L_c. Since $F^{'}(0)=-1$, as long as $F^{'}(G(a^*))>0$, there exists a $\bar{L}_c$ that satisfies $F^{'}(\bar{L}_c)=0$. Then, one can obtain $F(L_c)$ is decreasing for $L_c\in(0,\bar{L}_c)$ and increasing for $L_c\in(\bar{L}_c,G(a^*))$. If $F(G(a^*))>0$, i.e. $A>\frac{1}{\zeta[G(a^*)]^{\alpha-1}-(\zeta-1)[G(a^*)]^{\alpha}}$,[45] there exists a unique solution $L_c^*\in(\bar{L}_c,G(a^*))$ that satisfies $F(L_c^*)=0$. And The boundary condition $F(G(a^*))>0$ implies the condition $F^{'}(G(a^*))>0$.

[45] we proof $(\zeta-1)[G(a^*)]^{\alpha}-\zeta[G(a^*)]^{\alpha-1}<0$ by contradiction. Assume $(\zeta-1)[G(a^*)]^{\alpha}-\zeta[G(a^*)]^{\alpha-1}>0$, then we can obtain $\zeta-1>\frac{\zeta}{G(a^*)}$. Since $G(a^*)<1$, we have $\zeta-1>\frac{\zeta}{G(a^*)}>\zeta$, which is contradictory to $\zeta>1$. Thus, $(C-1)[G(a^*)-C[G(a^*)]^{\alpha-1}<0$.

Since we want to show how the mass of criminals (L_c) changes when iceberg trade costs (τ) or export fixed costs (f_x) increase finally, we need to find sufficient conditions for $\alpha > 2\zeta - 1$ and $A > \frac{1}{\zeta[G(a^*)]^{\alpha-1} - (\zeta-1)[G(a^*)]^{\alpha}}$ which only rely on the value of parameters excluding τ and f_x. According to the definition $\eta = (2\tau^{1-\sigma} + \tau^{2-2\sigma})^{\theta} f_x^{1-\theta}$ where $\tau \in [1, +\infty)$ and $f_x \in [0, +\infty)$, we have η is decreasing when τ or f_x increases. Thus, the value of η ranges from 0 to $+\infty$. Take the derivatives of ζ with respect to η in equation (39), we can obtain:

$$\frac{\partial \zeta}{\partial \eta} = \frac{\theta - 1}{[\cdots]^2} > 0,$$

since $\theta > 1$, which suggests that ζ is increasing with η. Then we have $\zeta(\eta) < \zeta(+\infty) = \frac{2\theta\sigma - 2\theta + 1}{2\theta\sigma - 2\theta}$. Thus, $\alpha > 2\zeta(+\infty) - 1 = \frac{\theta\sigma - \theta + 1}{\theta\sigma - \theta}$ is a sufficient condition for $\alpha > 2\zeta - 1$.

Then we want to show that $A > \frac{(2\theta\sigma - \theta - 1)^{\alpha+1}}{\theta(2\theta\sigma - 2\theta)^{\alpha-1}(4\theta\sigma^2 - 4\theta\sigma - 4\sigma + 3)}$ can ensure the satisfaction of $A > \frac{1}{\zeta[G(a^*)]^{\alpha-1} - (\zeta-1)[G(a^*)]^{\alpha}}$. Let $h(x) = \zeta x^{\alpha-1} - (\zeta - 1)x^{\alpha}$ where $x \in (0, 1)$. It can be shown that:

$$h^{'}(x) = (\alpha - 1)\zeta x^{\alpha-2} - \alpha(\zeta - 1)x^{\alpha-1} > x^{\alpha-2}(\alpha - \zeta) > 0$$

where the first inequality comes from the fact that $x < 1$ and $\zeta > 1$, and the second inequality comes from $\alpha > 2\zeta - 1 > \zeta$. Thus, $h(x)$ is increasing with x. Further, according to equation (36), we have the following equation:

$$a^{*-\theta} = \frac{1 - L_c}{1 + \frac{2\theta(\sigma-1)}{\theta-1}(1 + \eta)} < \frac{1}{1 + \frac{2\theta(\sigma-1)}{\theta-1}(1 + \eta)}$$

which leads to

$$G(a^*) = 1 - a^{*-\theta} > 1 - \frac{1}{1 + \frac{2\theta(\sigma-1)}{\theta-1}(1 + \eta)} = \frac{2\theta(\sigma - 1)(1 + \eta)}{(\theta - 1) + 2\theta(\sigma - 1)(1 + \eta)} \triangleq \rho$$

Since $h(x)$ is increasing with x, we have $h(G(a^*)) > h(\rho) = \zeta\rho^{\alpha-1} - (\zeta - 1)\rho^{\alpha} \triangleq \Upsilon$. Take the derivatives of Υ with respect to η, we can obtain:

$$\begin{aligned} \frac{\partial \Upsilon}{\partial \eta} &= \rho^{\alpha-1}\frac{\partial \zeta}{\partial \eta} + (\alpha - 1)\zeta\rho^{\alpha-2}\frac{\partial \rho}{\partial \eta} - \rho^{\alpha}\frac{\partial \zeta}{\partial \eta} - \alpha(\zeta - 1)\rho^{\alpha-1}\frac{\partial \rho}{\partial \eta} \\ &> \rho^{\alpha-1}(1 - \rho)\frac{\partial \zeta}{\partial \eta} + \rho^{\alpha-2}(\alpha - \zeta)\frac{\partial \rho}{\partial \eta} > 0 \end{aligned}$$

where the first inequality comes from $\rho < 1$ and the second inequality is derived from the following condition:

$$\frac{\partial \rho}{\partial \eta} = \frac{2\theta(\sigma - 1)(\theta - 1)}{[\cdots]^2} > 0$$

$\frac{\partial \Upsilon}{\partial \eta} > 0$ suggests that Υ is increasing with η, and hence $\frac{1}{h(G(a^*))} < \frac{1}{\Upsilon(\eta)} < \frac{1}{\Upsilon(0)}$. Thus $A > \frac{1}{\Upsilon(0)} = \frac{(2\theta\sigma - \theta - 1)^{\alpha+1}}{\theta(2\theta\sigma - 2\theta)^{\alpha-1}(4\theta\sigma^2 - 4\theta\sigma - 4\sigma + 3)}$ is a sufficient condition for $A > \frac{1}{\zeta[G(a^*)]^{\alpha-1} - (\zeta-1)[G(a^*)]^{\alpha}}$.

E.3 Proof of Proposition 1

Taking the derivatives of $\zeta(\tau, f_x)$ with respect to τ, we can obtain:

$$\begin{aligned}\frac{\partial \zeta}{\partial \tau} &= \frac{(2\theta\sigma - 2\theta + 1)\frac{\partial \eta}{\partial \tau}[2\theta\sigma - \theta - 1 + (2\theta\sigma - 2\theta)\eta] - (2\theta\sigma - 2\theta)\frac{\partial \eta}{\partial \tau}[2\theta\sigma - \theta + (2\theta\sigma - 2\theta + 1)\eta]}{[2\theta\sigma - \theta - 1 + (2\theta\sigma - 2\theta)\eta]^2} \\ &= \frac{(\theta - 1)\frac{\partial \eta}{\partial \tau}}{[2\theta\sigma - \theta - 1 + (2\theta\sigma - 2\theta)\eta]^2} < 0 \end{aligned} \tag{41}$$

due to $\theta > 1$. Applying implicit function theorem to $F(L_c^*) = 0$, we can derive:

$$\frac{dL_c}{d\zeta} = -\frac{F_\zeta(L_c^*)}{F_{L_c}(L_c^*)} = -\frac{AL_c^{*\alpha}(1 - L_c^*)}{F_{L_c}(L_c^*)} < 0.$$

Thus, if iceberg trade costs (τ) increase, ζ will decrease and the mass of criminals in the economy (L_c) will increase. (The proof is similar when we consider the effects of increasing fixed export costs f_x on national crime rate.)

E.4 Proof of Appendix Proposition 2

Take the derivatives on both sides of equation (40) with respect to τ, we can obtain:

$$\begin{aligned}\frac{\partial L_c}{\partial \tau} &= \frac{AL_c^{*\alpha}(L_c^* - 1)}{\alpha\zeta AL_c{*}\alpha - 1 + (1 - \zeta)(1 + \alpha)AL_c^{*\alpha} - 1}\frac{\partial \zeta}{\partial \tau} \\ &= \frac{AL_c^{*\alpha}(L_c^* - 1)}{F'(L_c^*)}\frac{-a^{*-\theta}}{2\theta\sigma - \theta - 1 + 2\theta(\sigma - 1)\eta}\frac{\partial \eta}{\partial \tau} \end{aligned} \tag{42}$$

where L_c^* satisfies $F(L_c^*) = 0$ and $F'(L_c^*) > 0$. The second equality is obtained by plugging the expression of $\frac{\partial \zeta}{\partial \tau}$ in equation (41) According to equation (36), we have:

$$a^{*-\theta} = \frac{(1 - L_c^*)(\theta - 1)}{2\theta\sigma - \theta - 1 + 2\theta(\sigma - 1)\eta} \tag{43}$$

Take the derivatives of $a^{*-\theta}$ with respect to τ, we can obtain:

$$\begin{aligned}\frac{\partial a^{*-\theta}}{\partial \tau} &= -\frac{\theta - 1}{2\theta\sigma - \theta - 1 + 2\theta(\sigma - 1)\eta}\frac{\partial L_c}{\partial \tau} - \frac{(1 - L_c^*)(\theta - 1)2\theta(\sigma - 1)}{[2\theta\sigma - \theta - 1 + 2\theta(\sigma - 1)\eta]^2}\frac{\partial \eta}{\partial \tau} \\ &= \frac{AL_c^{*\alpha}}{F'(L_c^*)}\frac{(\theta - 1)a^{*-\theta}}{[2\theta\sigma - \theta - 1 + 2\theta(\sigma - 1)\eta]^2}\frac{\partial \eta}{\partial \tau} - \frac{a^{*-\theta}2\theta(\sigma - 1)}{2\theta\sigma - \theta - 1 + 2\theta(\sigma - 1)\eta}\frac{\partial \eta}{\partial \tau} \end{aligned} \tag{44}$$

where the second equality is obtained by plugging the expression of $\frac{\partial L_c}{\partial \tau}$ in equation (42).

Then, combined with equations (37), (30) and (44), we have:

$$
\begin{aligned}
\frac{\partial L_d}{\partial \tau} &= \frac{2\theta(\sigma-1)}{\theta-1}a^{*-\theta}\frac{\partial \eta}{\partial \tau} + \frac{2\theta(\sigma-1)(1+\eta)}{\theta-1}\frac{\partial a^{*-\theta}}{\partial \tau} \\
&= \frac{2\theta(\sigma-1)}{\theta-1}a^{*-\theta}\frac{\partial \eta}{\partial \tau} + \frac{AL_c^{*\alpha}}{F'(L_c^*)}\frac{2\theta(\sigma-1)(1+\eta)a^{*-\theta}}{[2\theta\sigma-\theta-1+2\theta(\sigma-1)\eta]^2}\frac{\partial \eta}{\partial \tau} \\
&- \frac{[2\theta(\sigma-1)]^2(1+\eta)a^{*-\theta}}{[2\theta\sigma-\theta-1+2\theta(\sigma-1)\eta](\theta-1)}\frac{\partial \eta}{\partial \tau} \\
&= a^{*-\theta}\frac{2\theta(\sigma-1)}{\theta-1}\Bigg[\underbrace{\frac{\theta-1}{2\theta\sigma-\theta-1+2\theta(\sigma-1)\eta}}_{+} + \underbrace{\frac{AL_c^{*\alpha}}{F'(L_c^*)}\frac{(\theta-1)(1+\eta)}{[2\theta\sigma-\theta-1+2\theta(\sigma-1)\eta]^2}}_{+}\Bigg]\underbrace{\frac{\partial \eta}{\partial \tau}}_{-} \\
&< 0
\end{aligned}
$$

In sum, an increase in iceberg trade costs τ decreases labor demand. The proof is similar when we consider the effect of rising fixed export costs f_x.