ONLINE APPENDIX—not for publication

A The Million-Rouble plants in context

In this section, we provide additional information about the Million-Rouble plants. First, we summarize the historical context and geopolitical background. Second, we present the Sino-Soviet cooperation during the First Five-Year Plan and the characteristics of the plants built under the program, and discuss how the sites were selected. Finally, we review the evolution of the Million-Rouble Plants (MRPs) and other place-based policies after the end of the First Five-Year Plan.

A.1 Historical context

Leaning to one side When the People's Republic was established in 1949, World War II and the civil war had left China a poverty-stricken agrarian country. The new Communist regime was isolated, as the Western world recognized Chiang Kai-shek's Taiwan-based power as the legitimate representative of China. To ensure national security and economic prosperity in such a context, Chinese leaders planned to industrialize the economy rapidly, prioritizing heavy industry as the basis of production.[32] China lacked resources to develop its industry, and turned to the Soviet Union. Despite ideological proximity, economic cooperation with the U.S.S.R. was not obvious. Pre-1949 economic relationships between the two countries were thin, and the Komintern had repeatedly talked the Chinese Communists into supporting the Nationalists, which they then saw as the only political force able to rule China. The Soviet Union was however the only advanced economy China could turn to in the 1950s. First, because it was sympathetic to the new regime's revolutionary agenda. Second, because of that regime's isolation: Washington and its allies imposed an embargo that prevented Communist China from importing the technology and resources needed to develop its industrial base (Zhang, 2001). The subsequent alliance with the U.S.S.R., which Chairman Mao called "leaning to one side" in a famous speech,[33] was further reinforced by the Korean War, which the U.S.S.R. fought vicariously through a Chinese "People's Volunteer Army" of 250,000 men.

Sino-Soviet cooperation On February 14, 1950, the Treaty of Friendship and Alliance was signed between China and the U.S.S.R. A series of agreements ensued, paving the way for a comprehensive economic and scientific cooperation that spanned China's First and half of its Second Five-Year Plans (1953–1957 and 1958–1962).

[32] In the words of future Premier Zhou Enlai, "without heavy industry, there will be no foundation for the national industry" (January 1942).

[33] "On the People's Democratic Dictatorship" (June 30, 1949).

The cooperation between China and the Soviet Union assumed two main aspects: scientific and economic, both embodied in the "156" program. Soviet experts were dispatched to China to advise Chinese planners and supervise investments in the field. At the peak of the Sino-Soviet alliance, 20,000 experts were present in China (Zhang, 2001; Wang, 2003). Although Soviet experts were involved in all aspects of central planning, in particular during the First Five-Year Plan, their presence was crucial for the "156" program. They were responsible for the design and construction of the plants, and they trained Chinese cadres and workers to run the factories and operate and maintain equipment. To ensure the sustainability of the program, 80,000 Chinese students were sent to Soviet universities and technological institutes, with the perspective of a position in one of the plants upon return.

Economic cooperation involved technology and financial transfers. Technology transfer was a major component of the "156" program in particular. The equipment supplied by the U.S.S.R. was among the most advanced at the time (Lardy, 1987).[34] Blueprints and technical documents for production were shared with Chinese engineers free of charge,[35] allowing China to gradually absorb and adapt Soviet technologies (Xiao, 2014). In the agreements that created the "156" program, the Soviet Union committed to carrying out all the design work, from choosing the sites to implementing the design, providing the required equipment and supervising construction, as well as overseeing new product manufacturing and training ordinary workers, technicians, and all necessary cadres.[36]

The financial resources provided to China by the U.S.S.R. mostly consisted of loans. During his first visit to the U.S.S.R., Chairman Mao negotiated a \$300,000,000 loan (in 1955 prices, corresponding to \$2.9 billion in 2020 prices) at the preferential rate of 1% per annum, which financed part of the "156" program. China was also to reimburse the Soviet Union for the construction of the plants by providing 160,000 tons of tungsten concentrate, 110,000 tons of tin, 35,000 tons of molybdenum concentrate, 30,000 tons of antimony, 90,000 tons of rubber, and other produce including wool, rice, or tea. Some low-skilled workers were also sent to Siberia. Besides loans, Soviet cooperation did however involve an aid component. Technological cooperation implied free transfers of blueprints and documents, the monetary value of which should not be downplayed. The U.S.S.R. also granted China product manufacturing

[34] The last 15 projects agreed on in 1954 as part of the "156" program benefited from state-of-the-art equipment that few Soviet factories enjoyed (Goncharenko, 2002).

[35] See "Agreement on aid from the U.S.S.R. government to the P.R.C. government to develop the Chinese national economy" (May 15, 1953).

[36] The U.S.S.R. provided between 50% and 70% of the value of the equipment necessary to build the plants (Dong, 1999). The remainder could be produced locally and was not covered by the cooperation.

patents that alone represented a value of about 3–3.5 million roubles (Dong, 1999).

A.2 The Million-Rouble plants

Chronology The "156" program was decided through three agreements. The first 50 plants were negotiated during Chairman Mao's first visit to the U.S.S.R. (Winter 1949/50). On May 15, 1953, Li Fuchun and Anastas Mikoyan signed the "Agreement on aid from the U.S.S.R. government to the P.R.C. government to develop the Chinese national economy." The parties agreed on building 91 additional industrial projects, and the 141 plants were to be built between 1953 and 1959.[37] In October 1954, Khrushchev visited Beijing and signed with his Chinese counterpart a protocol to build 15 additional industrial plants, completing the Soviet-sponsored "156" program. A total of 150 plants were complete and operational by 1960 (Dong and Wu, 2004). Because 156 projects had initially been touted, speeches and reports continued to refer to the "156" program.

Characteristics of the plants The industrial cooperation spanned a wide range of sectors (including aircraft, machinery, electronic industry, and weapons), which gave priority to heavy industry. Table 2 summarizes the distribution of the plants by industrial sector. A majority of plants operate in the heavy, extractive, and energy sectors. China had the experience and capacity to build most light-industry factories, so that Soviet cooperation concentrated on sectors and tasks that China lacked the skills and wherewithal to develop (see Giorcelli and Li, 2022). Military-related industries made up a fifth of the plants, reflecting geopolitical concerns.

The MRPs brought about a large technological shift. The sheer size of the investments and their focus on industry was meant to transform China from a subsistence-farming to an industrial economy. The average plant constituted an investment of about 130,000,000 yuan or 20,000,000 Soviet roubles in 1957, which is the equivalent of $160,000,000 in 2010 U.S. dollars. Some plants "produced many new products that China had never produced in history" (Li, 1955a), e.g., the Luoyang Truck Factory, which produced China's first truck (see Figure A1 for a view of what is now YTO Group Corporation).

Location decisions One of the main tasks of the Soviet experts was to help determine the optimal location for the plants (Li, 1955b). Bo Yibo, a prominent leader personally involved in the design of the "156" program, outlines four main

[37]Construction work began on average in 1954 and was completed in 1958. Mean start and end dates by sector are provided in Table 2.

Figure A1. Contemporary view of the Luoyang Truck Factory.

Note: This figure reproduces a contemporary view of the Luoyang Truck Factory, now YTO Group Corporation. In the foreground, we can see the buildings of the Luoyang Truck Factory, constructed as part of the "156" program. Source: YTO Group Corporation website [http://www.yituo.com.cn/; accessed September 11, 2018].

criteria guiding the location decision process (Bo, 1991). Plants had to be built close to natural resources to reduce transportation costs and avoid waste. Places easily accessible through the road and railway network should be favored, so as to reach down- and upstream firms and end-consumer markets at a lower cost. Regions with no pre-existing industrial base would be given priority. Conditional on meeting these first criteria, the MRPs were to be built out of the reach of U.S. and Taiwanese bombers. The first two criteria were meant to select optimal locations from an economic point of view. Numerous Soviet textbooks on factory location choice were translated and adapted in 1950s China, and the text of the First Five-Year Plan contains a whole section on rational plant location based on geography. A Russian-Chinese thesaurus with a special focus on factory location choice was also published. Soviet plant location textbooks emphasized the importance of pre-selecting several locations, comparing them based on a list of objective criteria, and making field trips to the short-listed sites. Among the main criteria were easy access to natural resources, transportation network, and market access. The third criterion does not appear as a goal in its own right in other sources. A significant share of the MRPs were built in previously agrarian regions, but possibly because the threat of U.S. and Taiwanese air strikes called for industrializing the hinterland. This third criterion is however a common feature of place-based policies, as policy makers are often willing to correct perceived inequalities in the spatial distribution of economic activity.

Soviet experts recommended, in order to minimize costs, that priority be given to expanding existing plants. Stalin expressed this idea himself in a 1952 conversation with Zhou Enlai,[38] although he also advised the Chinese to build *new* plants, in

[38] "Minutes of Conversation between I.V. Stalin and Zhou Enlai," September 03, 1952, History and Public Policy Program Digital Archive, APRF, f. 45, op. 1, d. 329, ll. 75-87. Translated by

particular defense industry factories, far away from the coast and borders, a lesson the U.S.S.R. had bitterly learnt in World War II. Chairman Mao was apparently responsible for making military security a major tenet of the "156" program (Xia, 2008).[39] An example of the attention paid to military security is the Rehe Vanadium and Titanium Factory, originally located at Nü'erhe, near Jinzhou, Liaoning province. On May 16, 1955, the Heavy Industry Department issued a report arguing that this location, about 10 kilometers from the Gulf of Bohai, did not follow closely enough the "not building, not expanding in coastal areas" principle. They instead recommended that Soviet experts reconsider the site. The plant was eventually built in Shuangtashan, near Chengde, Rehe (today, Hebei) province, 100 kilometers away from the sea (Chinese Academy of Social Sciences and State Archives Administration, 1998). Most MRPs were constructed along this "Second Front."

In 1953, China's aviation was non-existent, which explains the importance of Soviet military protection.[40] The People's Liberation Army only developed aviation thanks to Soviet support and because of the pressing needs of the Korean War. One of its pioneer pilots and later vice-commander of the Nanjing Air Command recalled that "when Chairman Mao declared that China would join the Korean War, the Chinese air force did not have one operational unit that could [be] put into the air" (Bergin, 2013). Even after the Korean War, China's air force was recognized as woefully inadequate.[41] The Chinese government would thus shelter the brand new "156" plants close to allied air bases. The 1950 Treaty of Friendship and Alliance indeed assured them that the Soviet Union would defend China in case of foreign aggression. Bo, who was personally involved in plant location decisions, reports that senior military officials took part in the deliberations: "when examining plant locations, [they] would place plant sites on a map", along with all U.S. bases in Taiwan, South Korea and Japan, to determine "which types of American planes could attack which sites" (Bo, 1991).

Danny Rozas. Available at http://digitalarchive.wilsoncenter.org/document/111242.

[39]The concern with enemy attacks of the new plants can also be seen from the pages of the *Russian–Chinese Technical Thesaurus: with reference to factory location choice* (1954): "Shelter, air-raid dugout" unexpectedly features among the characteristics that a factory must have.

[40]Whatever was left from World War II was either taken to Taiwan or sabotaged by the Nationalists before their exile. Chongqing's Baishiyi airfield, for instance, fell victim to such scorched-earth policy and could not be used between 1949 and 1959, when it was eventually rebuilt.

[41]Another of China's first pilots interviewed by Bergin, and later chief pilot of China's first indigenous aircraft, recounts that "Soviet Premier Nikita Khrushchev said that without Soviet help, the Chinese air force would become a Chinese ground force in three months" (Bergin, 2013).

A.3 Evolution of the plants and later place-based policies

This paper studies the effect of the MRPs over the long run; it is thus critical to understand what they became after the end of the First Five-Year Plan (1953–1957). In what follows, we describe the evolution of the MRPs through the end of the First Five-Year Plan, the Sino-Soviet split, the Cultural Revolution, and the introduction of economic reforms.

End of the First Plan The Sino-Soviet cooperation survived beyond the First Five-Year Plan: 102 of the "156"-program plants became operational during the Second Five-Year Plan, not so much due to delays as to the original agreements between Beijing and Moscow. Two similar agreements were signed on August 8, 1958 and February 7, 1959 to expand Sino-Soviet cooperation and build 125 additional large plants, which were to be built during the Second and Third Five-Year Plans. The 1960 split however curtailed this second wave of investments. The MRPs constitute the only large-scale industrialization program carried out in China thanks to Soviet cooperation.

However, some of the Second Five-Year Plan factories could be completed before or shortly after the Sino-Soviet split. The spirit of the "156" program and subsequent Sino-Soviet cooperation was indeed that the U.S.S.R. would provide financial and technical support only where China's capabilities were wanting. As China had built capabilities during the 1950s, the new 125 plants were logically less intensive in Soviet inputs. We use the completed and abandoned Second Five-Year Plan factories in an alternative identification strategy in Appendix D.1, Table D5.

Sino-Soviet split Sino-Soviet relations were strained in the late 1950s by rapid ideological divergence. After Stalin's death, ideological and political tensions started to rise with Khrushchev's condemnation of his predecessor's crimes in 1956 and his policy of "peaceful coexistence with the West." As China kept encouraging a Stalin-like cult of Mao's personality and pursued an aggressive foreign policy, the normalization of the Soviet regime and prospect of *détente* between the two superpowers could only worry Chinese leaders.

The Sino-Soviet split materialized in 1960 when Soviet experts and Chinese students were suddenly repatriated. Incomplete projects that were not viable were abandoned, while future investments were canceled. Six of the MRPs were not operational and could not be completed without Soviet support and were closed. Viable investments were, however, maintained, and our archival research shows that they still benefited from investments of state-of-the-art technologies. Some of the largest

MRPs, like Angang, indeed published their own gazetteers, where investments along with monetary values are recorded year after year. Just after the Sino-Soviet split, in the period 1963–1965, Angang invested 248 million yuan in capital construction, followed by 1,383 million in 1966–1975. Such investments were made possible by China's growing industrial capacity, but also by frontier technology imports from Eastern European countries, with some of which China maintained friendly relations throughout the period,[42] and from Western countries after the thaw in diplomatic relations with China in the second half of the 1960s and in the 1970s.

The split did however induce a dramatic shift in China's alliances and conception of national security. The sites that had been carefully selected because they could benefit from Soviet or North Korean protection now appeared vulnerable. Subsequently, Mao launched in 1964 the "Third Front Movement" (*Sanxian jianshe*), a new wave of industrial investments (mostly in heavy industry) directed at remote inland areas.

Third Front Movement The Third Front Movement, which covers the period 1964–1980, is notorious for the costly moving of plants and workers, from sensible locations to places "close to mountains, dispersed, and hidden" (*kaoshan, fensan, yinbi*). Such spectacular moves were however the exception rather than the norm: they were to be restricted to strategic military industries, remain exceptional, and not be carried out on a large scale.[43] "First Front" industries (on the coast and in major cities) would be affected, as they were deemed the most vulnerable to foreign attacks. The motto for the recently built "Second Front" industries, to which the MRPs belonged, was however to continue developing them as previously planned. Only three plants built under the "156" program were entirely or partly moved. A first check of the robustness of the rise and fall pattern observed in the paper is to exclude these displaced investments (see Appendix Table D4, Panel B). In this exercise, we also exclude 15 MRPs that closed down during the reform era; almost all of them operated in the extractive sector and went into liquidation because of the depletion of the natural resource they exploited.

A concern with the Third Front Movement is that, although Second Front industries, and the "156" plants in particular, were largely unaffected, massive investments were directed toward other provinces, which may have hurt the economic environment of the MRPs. To check whether Third Front investments diverted resources away from the treated counties and explain their decline in the second period, we

[42] For instance, industrial collaboration with Poland allowed China to build an activated carbon plant in Heilongjiang in 1968.

[43] *Comrade Fuchun's summary report to the National Planning Meeting*, October 20, 1964.

use the list of Third Front provinces from Fan and Zou (2019). Table D4, Panel A, controls for concurrent policies and includes an indicator variable equal to 1 if a county belongs to such a province and 0 otherwise. We find that this control does not alter the results.

The Third Front Movement and "156" program both incorporated military imperatives in plant location decisions, but they were designed in different geopolitical situations. We show the induced variation in vulnerability in Figure 2, and we condition for the later vulnerability in our baseline specification.[44]

Cultural Revolution A few years after the construction of the MRPs had been achieved, Chairman Mao launched the "Great Proletarian Cultural Revolution." This movement, which officially lasted between 1966 and 1976, triggered a period of political turmoil that mostly affected urban areas and large enterprises. Industry valued added dropped from 44.6 to 12.6 million Chinese yuan (in constant 1990 prices) between 1966 and 1967, and it would not recover until 1980 (Dong and Wu, 2004). Because they were more industrialized, the counties treated under the "156" program may have suffered disproportionately from the Cultural Revolution, and the disorganization of production may have affected their trajectory beyond 1976, leading to the rise-and-fall pattern that we observe.

To control for the effect of the Cultural Revolution, we use data collected from 2,213 local annals (*difang zhi*)—see Walder (2014). Information about the number of "casualties" from the Cultural Revolution was culled from the historical narratives included in the annals. "Casualties" can be divided into two categories: the number of "unnatural deaths" and number of "victims," which may refer to any type of political persecution from expulsion to public beatings. Because the county annals were encouraged but not required to publish any figures about Cultural Revolution violence, assumptions need to be made to deal with missing information. We follow Walder (2014) and code missing values as 0 even if the narrative does refer to casualties but without stating a figure.[45] Appendix Table D4, Panel A, uses the casualties data to condition for Cultural Revolution violence. Including these controls does not alter the results; the disruption created by the Cultural Revolution

[44] In the right panel of Figure 2, we measure vulnerability in 1964, at the onset of the Third Front Movement. The effects are similar if we control for a milder version of 1964 vulnerability, considering U.S.S.R. and North Korean air bases as neutral rather than as threats. We also find the same rise-and-pattern if we control for vulnerability to U.S. or Taiwanese bombings in 1990, i.e., following the collapse of the Soviet Union and using the locations of air bases in that year. (Results available upon request.)

[45] Alternatively, we can (i) restrict the sample to counties with non-missing data, or replace missing values by (ii) the provincial average, (iii) the maximum in the province, or (iv) the minimum in the province. Results are not affected by these various imputation rules.

does not explain the decline of treated counties.

Economic reforms The transition from central planning to a more market-oriented economy may have dealt a severe blow to the state-owned "156" plants.

The MRPs weathered the economic regime change quite well. Only 15 plants closed down, and the decline of treated counties between 1982 and 2010 is not due to Million-Rouble plants going bust (see Appendix Table D4, Panel B). About a third of the "156" plants evolved into large, diversified industrial groups (*jituan*). Examples of such *jituan* include Ansteel, which evolved from the Anshan Iron and Steel Company and is now listed on the Shenzhen and Hong Kong Stock Exchanges. Figure A2 displays a picture of the main plant in 2016.

Figure A2. Entrance of the main Ansteel group plant in 2016.

Source: Ansteel Group Corporation (2016).

We further rely on the NBS above-scale survey (1992–2008) to shed light on the evolution of the MRPs—see Appendix A.4 for a description of the procedure followed to match plants with firms and a comparison of the MRPs with other firms in the same county. We find that (i) most plants are still active today (94 of the 125 MRPs that operated in the manufacturing sector could be identified) and (ii) they are on average four times as productive as other above-scale firms (controlling for size; see Table A1 and the detailed discussion in Appendix A.4).

Another major feature of China's development since the 1980s is the creation of Special Economic Zones and various types of industrial parks. These may have attracted production factors because of the promise of superior returns despite treated counties being productive and still growing. To test for this factor, we use industrial parks data from Zheng et al. (2017). The data are at the prefecture level and provide us with the number of industrial parks extant in a prefecture at some point in five-year intervals, covering the period 1980–2005. Appendix Table D4, Panel A controls for the total number of industrial parks in the prefecture and shows that the results are robust to this place-based policy.

A.4 MRPs today

The rise-and-fall pattern experienced by treated counties might partly reflect the experience of the MRPs themselves. Local economies may have thrived following the physical capital investments of the "156" program and then declined as this capital depreciated. Such a co-evolution of the MRPs and local economies could occur because of (i) the sheer size of MRPs in local economies and (ii) spillover effects.

In this appendix, we first present how we identify MRP descendants in the establishment-level data. Next, we investigate the size of MRP descendants in the local economy, and we compare their performance with non-descendant firms. Finally, we provide evidence on their relative dynamics to assess whether the MRPs might have dragged other firms down.

Definition of MRP descendants The Million-Rouble plants founded in the 1950s have evolved into large business groups (*jituan*) that span multiple establishments. In the paper, we *exclude* from all our baseline regressions the establishments that belong to the MRPs or their daughter firms. This allows us to abstract from firm boundaries and the division of labor between establishments within business groups, and thus to focus on the spillovers that the MRPs exert on their local economies.

We identify the "legal units" (*faren danwei*) descended from the "156"-program plants in the annual firm survey data described in Section 3. We combine manually collected information on the histories of the MRPs (relying on historians' works, our own archival research, and information from the Chinese search engine Baidu) with a fuzzy matching algorithm based on firm names, locations, industries, and other characteristics. More precisely, we first convert MRP names (both current and older names) into keywords, which allow us to identify potential descendants in the establishment-level data. We then manually identify *direct* descendants of the MRPs among that set of observations based on available historical information. We next use the fuzzy matching algorithm to categorize the remainder of establishments into *indirect* descendants and non-descendants. We finally check manually the quality of the matches.

This process allows us to match 117—or 94%—of the 125 Million-Rouble plants operating in the manufacturing sector to at least one observation in the establishment-level data. The MRPs have on average 2.75 direct descendants and 34 indirect descendants. Despite the expansion of the MRPs into large business groups, MRP descendants remain geographically clustered: 100% (64%), 96% (58%), and 66% (27%) of (in)direct MRP descendants operate in the same province, prefecture, or county, respectively, as the original "156"-program investment.

Size and performance in the local economy We first assess the quantitative importance of the MRPs in their local economies. Table A1 relies on the identification of the MRPs in the "above-scale" firm data to compute the share of the MRPs in the economies of treated counties. Over the period 1998–2007, MRPs accounted for a moderate share of the economic activity in treated counties: they represented 2.32% of manufacturing employment, 2.07% of capital, 2.67% of the total wage bill in that county × year, 1.00% of TFP, 3.16% of patents, and 0.98% of total markups.[46] Table A1 shows that the MRPs do not account for a large share of the local economies; their effects must therefore come from the spillovers that they exert. Two points however stand out: first, MRP descendants contribute *more* in terms of patents compared to their share of employment; second, they contribute *less* in terms of TFP, which is likely due to differences in size and exhausted gains from economies of scale.

Table A1. Share of the Million-Rouble plants in local economies.

	Percent of MRP descendants			Observations
	Direct	Indirect	All	
	(1)	(2)	(3)	(4)
Labor	0.787	1.531	2.317	926
Capital	1.004	1.068	2.072	926
Compensation	1.031	1.641	2.673	926
TFP	0.029	0.968	0.997	926
Patents	2.331	0.832	3.163	489
Markup	0.033	0.950	0.983	814

Notes: The sample consists of treated counties and covers the years in the period 1998–2007. For each variable, the table displays the shares of direct (column 1), indirect (column 2), and all (both direct and indirect; column 3) MRP descendants. See the text for a detailed description of the identification of descendants. *Labor* is the total number of employees. *Capital* is the total amount of real capital. *Compensation* combines wages, housing subsidies, pension and medical insurance, and welfare payable. *TFP* refers to total factor productivity in revenue terms and follows Imbert et al. (2022)—see Appendix B.2 for details. *Patents* is the total number of patents registered by firms in a given year. *Markup* is total markup, following De Loecker and Warzynski (2012)—see Appendix B.3 for details. Note that some county×year observations do not exhibit any patent registration or do not have firms with no missing values for the variables needed to compute markups; we exclude such observations from the calculation of shares.

We next provide evidence of the size and performance of the MRPs relative to other firms in treated counties. In Table A2, we regress various outcomes on an indi-

[46]Not all MRPs could be matched to firms in the "above-scale" data. Although unmatched MRPs are likely smaller than matched MRPs, these figures should be interpreted as lower bounds.

cator variable equal to 1 if the establishment is a descendant of a 156-program plant, and 0 otherwise. We distinguish between direct and indirect descendants in Panel A and B, respectively, and consider all descendants in Panel C. Table A2, Panel A shows that the direct descendants of MRPs are an order of magnitude larger than than other establishments in the same county. They are also an order of magnitude above other firms in other respects—capital, return to labor, and innovation. Despite being 13 times as big, which expectedly lowers their TFP and innovation per capita, we see that they register 6 times as many patents as the average other establishment and that their lower TFP is partly due to higher competition.[47] This shows that Million-Rouble plants are unique firms in the industrial landscape of treated counties. To this day, they act as major innovation powerhouses and would be expected to exert large (positive) spillovers on their local economies.

Panel B shows that indirect descendants of MRPs are markedly different both from direct descendants and from other establishments. Although they are significantly (almost 50%) larger than other firms, they are much smaller than direct descendants. More importantly, indirect descendants are *less* likely to innovate than other, non-descendant establishments. This last result motivates our exclusion of both direct and indirect descendants from our baseline regressions: If MRPs restructured their production to concentrate innovation and high-value activities in core, flagship establishments, and devolved low-innovation, low-value activities to peripheral daughter firms, as the coefficient in Panel B, column 5 might suggest, including indirect descendants among non-MRP firms would bias our results toward finding the negative spillovers that we present in Section 4.

MRP dynamics We finally investigate the dynamics of MRP descendants. We first compare in Figure A3 direct MRP descendants with other establishments to assess their relative size and performance over time. More precisely, we regress outcomes of interest on an indicator variable equal to 1 for direct MRP descendants and 0 otherwise for each year separately and report the coefficients and 95% confidence intervals associated with the MRP dummy against time. All regressions include 2-digit industry fixed effects, and we include establishments from both treated and control counties to avoid mechanically inflating MRP performance by comparing them to the weaker firms in their own counties—see Section 4.[48] We observe again

[47]Our outcomes of interest may be systematically correlated with firm size. Controlling for size, however, the negative coefficient in column 4 is divided by 3 and MRP descendants still exhibit significantly higher innovation than other establishments (results not reported).

[48]Figures A3 and A4 below are similar when the sample is restricted to only MRP descendants in treated counties and establishments in the control group—results not reported.

Table A2. MRP size and performance relative to other firms in treated counties.

	Labor	Capital	Wage	TFP	Patents	Markup
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Direct descendants						
MRP	2.631	3.404	0.406	-0.802	1.814	-0.163
	(0.158)	(0.175)	(0.089)	(0.099)	(0.333)	(0.061)
Obs.	139,445	139,445	139,445	139,445	139,445	87,172
Panel B: Indirect descendants						
MRP	0.477	0.279	0.153	-0.227	-0.049	-0.105
	(0.092)	(0.162)	(0.035)	(0.085)	(0.019)	(0.017)
Obs.	139,445	139,445	139,445	139,445	139,445	87,172
Panel C: All descendants						
MRP	0.703	0.605	0.180	-0.288	0.144	-0.112
	(0.099)	(0.181)	(0.034)	(0.088)	(0.049)	(0.015)
Obs.	139,445	139,445	139,445	139,445	139,445	87,172

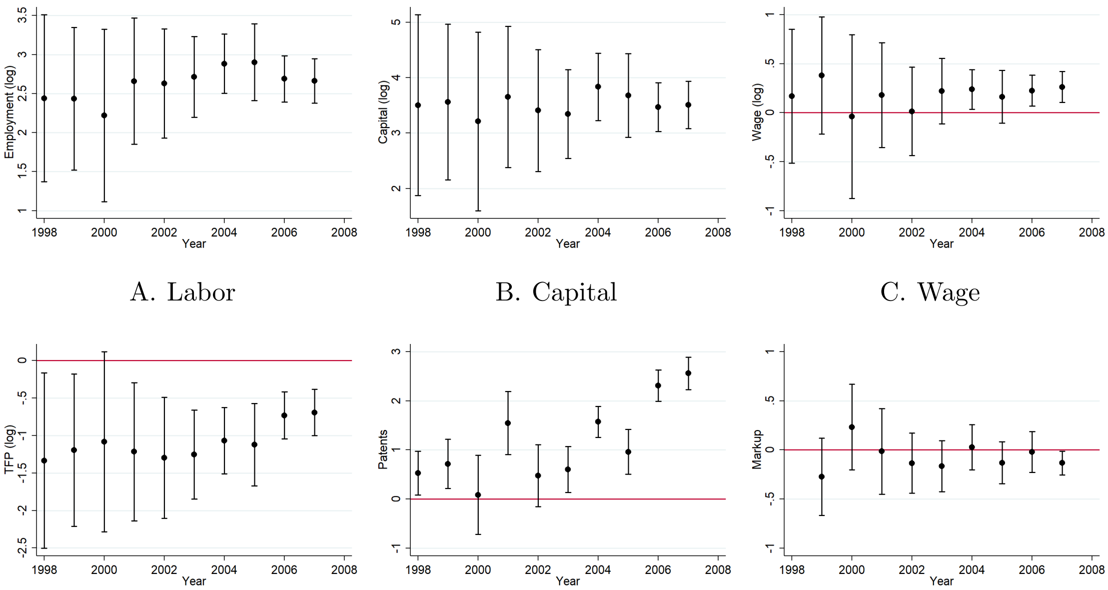
Notes: Each cell is the outcome of a separate regression. Standard errors are clustered at the 2-digit industry level (reported between parentheses). The unit of observation is a firm × year. The sample covers the period 1998–2007 and contains only treated counties. All specifications include county fixed effects and year fixed effects. In each Panel, the main independent variable is an indicator variable equal 1 if an establishment belongs to or is descended from a Million-Rouble plant (MRP); Panel A considers only direct descendants, Panel B considers only indirect descendants, and Panel C considers both. See the text for a detailed description of the identification of descendants. *Labor* is the logarithm of the number of workers; *Capital* is the logarithm of real capital; *Labor cost* is the logarithm of total compensation per employee; *TFP* is the logarithm of firm-specific total factor productivity as computed in Imbert et al. (2022); *Patents* is the number of patent applications registered by the firm; *Markup* is a dummy equal to one if the markup is above the median within a 4-digit industry × year cell, computed following De Loecker and Warzynski (2012)—see Appendix B. Note that some firms lack the information necessary to compute markups.

that MRPs are an order of magnitude larger than other firms, both in terms of employment and capital. Whereas employment follows a (noisily estimated) upward trend (Panel A), capital (Panel B) remains relatively stable. The average compensation per worker (Panel C) exhibits an upward trajectory. TFP (Panel D) is significantly lower in direct descendants throughout the period but experiences, if anything, an increasing trend. The dynamics in terms of the number of patents (Panel E) registered is the most striking: in the late 1990s, when patent registration was still in its infancy in China, MRPs were already ahead of other firms in terms of patent registration (albeit not every year), and they have kept diverging from the rest over the period 1998–2007. Conversely, they do not differ from other firms in terms of markup (Panel F).[49]

We then compare all MRP descendants with other establishments in Figure A4. The ascending pattern visible for direct descendants is even more obvious when all MRP descendants (both direct and indirect) are considered. The establishments descended from "156"-program plants are growing in terms of employment, capital, wages, and patent registrations. TFP is still lower, although it exhibits a rising trend in later years. There is no clear pattern as far as markups are concerned.

Million-Rouble plants are thus highly innovative and dynamic firms. Set against the findings of Section 4, the results presented in this appendix offer a stark contrast to other firms in their counties, which are less productive, less innovative, and less competitive than firms in ex-ante comparable control counties.

Figure A3. Dynamics of Million-Rouble plants—direct descendants.



A. Labor

B. Capital

C. Wage

D. TFP

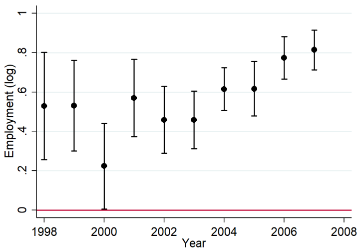
E. Patents

F. Markup

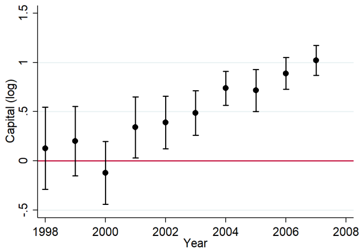
Notes: The sample consists of both treated and control counties and covers the years in the period 1998–2007. The unit of observation is a firm × year. *Labor* is the logarithm of the number of workers; *Capital* is the logarithm of real capital; *Labor cost* is the logarithm of total compensation per employee; *TFP* is the logarithm of firm-specific total factor productivity as computed in Imbert et al. (2022); *Patents* is the number of patent applications registered by the firm; *Markup* is a dummy equal to one if the markup is above-median within a 4-digit industry × year cell, computed following De Loecker and Warzynski (2012)—see Appendix B; this variable is not available for 1998. The independent variable is an indicator variable equal 1 if an establishment belongs to or is directly descended from a Million-Rouble plant (MRP)—see the text for details. All regressions include 2-digit industry fixed effects.

[49]We observe similar dynamics when we control for (log) employment in Panels B–F—results not reported.

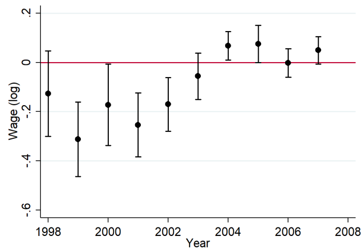
Figure A4. Dynamics of Million-Rouble plants—direct descendants.



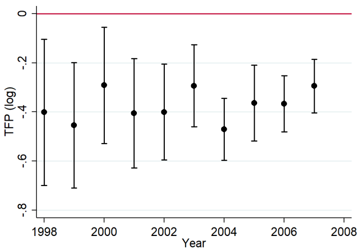
A. Labor



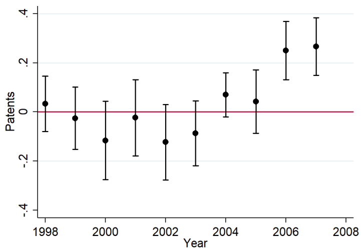
B. Capital



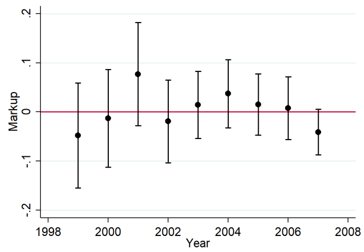
C. Wage



D. TFP



E. Patents



F. Markup

Notes: The sample consists of both treated and control counties and covers the years in the period 1998–2007. The unit of observation is a firm × year. *Labor* is the logarithm of the number of workers; *Capital* is the logarithm of real capital; *Labor cost* is the logarithm of total compensation per employee; *TFP* is the logarithm of firm-specific total factor productivity as computed in Imbert et al. (2022); *Patents* is the number of patent applications registered by the firm; *Markup* is a dummy equal to one if the markup is above-median within a 4-digit industry × year cell, computed following De Loecker and Warzynski (2012)—see Appendix B; this variable is not available for 1998. The independent variable is an indicator variable equal 1 if an establishment belongs to or is (directly or indirectly) descended from a Million-Rouble plant (MRP)—see the text for details. All regressions include 2-digit industry fixed effects.

B Data description

In this section, we describe: the firm data and the measures of concentration; the construction of factor productivity at the establishment level (identified using industry-specific CES production functions and an exogenous labor supply shifter, see Imbert et al., 2022); the linkages between patent applications and manufacturing establishments (He et al., 2018); and the identification of markups (De Loecker and Warzynski, 2012).

B.1 Data description, product codes, and measures of concentration

This section provides a quick description of the firm survey, describes how we associate a product code to each firm in every year, and details how we produce measures of concentration.

Data description Our main analysis in Sections 4 and 5 relies on a survey of manufacturing firms conducted by the National Bureau of Statistics (NBS), which collects basic accounting information for state-owned manufacturing enterprises (SOEs) and for private manufacturing establishments. Reporting is mandatory for the former, and is conditional for the latter on annual sales: above RMB 5 million, private manufacturing establishments are expected to fill the survey (compliance is fairly high, as shown in Imbert et al., 2022). The available information includes: (i) all accounting variables—capital is reported at face value without accounting for depreciation, so that it requires adjustments, but the other variables are standard; (ii) size of the workforce; (iii) names and addresses of the establishment, which allows us to geo-locate it at the postcode level and to link establishments over time (see Imbert et al., 2022, for a description of the linking procedure). The output is a standard survey of establishments, which covers the vast majority of the manufacturing production in China from 1992 to 2008.

One major issue with the survey—given the purpose of our analysis—is that every establishment reports a 4-digit industry code, but only reports a textual description of its products: there is a need to classify products in a more systematic way.

Product codes Manufacturing establishments report a textual description of up to three products, together with all the other accounting variables. This reporting process is not disciplined by the National Bureau of Statistic in any way. The descriptions do not include any code and do not follow any standards: how to describe the final product(s) is entirely up to the establishment manager (or to the establishment representative who is responsible for filling the survey). We rely on a systematic text analysis developed in Imbert et al. (2022) to exploit this undisciplined information and classify products in a similar fashion as in other, more standard establishment data (e.g., Bureau of Labor Statistics Micro-Data).

The procedure follows three steps. In the first step, we collect a standard product classification—the Harmonized Commodity Description and Coding Systems (HS),—which comes with (i) a hierarchical code and (ii) a textual description in Chinese. We "tokenize" these descriptions, i.e., we transform both the latter description and the product information provided by establishment managers into lists of relevant words. This step produces two data sets: one containing lists of words that uniquely characterize a HS code at the 6-digit level; and one containing lists of words that summarize the product descriptions provided by establishments. In the second step, we project these sentences, or lists of words, using "word2vec" (Mikolov et al., 2013) trained on the Wikipedia corpus. The third step uses these projections across the two data sets to identify the closest HS code at the 6-digit level for each product description (typically based on a similarity score). The outcome of this three-step procedure is a list of the ten closest HS product categories at the 6-digit level and available for up to three product descriptions provided by each establishment in any given year. We describe next how we exploit this product information to identify possible linkages across establishments.

Measures of concentration The characterization of products in the NBS survey is instrumental in identifying linkages across establishments and the concentration of production within Chinese counties. Consider two establishments (i, j) within a given county and let (p_i, p_j) denote their respective "best-matched" product codes. Assume that we can characterize the proximity between two establishments by a function of their products, $\alpha(., .)$, e.g., capturing whether they operate along the same production chain or whether they use similar technologies. The quantity $\alpha(p_i, p_j)$ thus represents the proximity between the previous two establishments.

To construct a measure of product concentration at the county level, we build upon the previous measures and aggregate employment (a measure of firm size) across product categories: $\alpha(p, q)$ represents the proximity between products p and q which needs to be weighted by their respective output shares, s_p and s_q. A measure of concentration is thus,

$$h = \sum_{p,q} \alpha(p, q) s_p s_q.$$

This measure can be best understood as an Herfindahl index. Indeed, let the vector

$\mathbf{S} = (s_p)_p$ denote the output shares in each HS 6-digit product category and the symmetric square matrix $\mathbf{M} = (\alpha(p,q))_{p,q}$ represent the bilateral proximity between product codes. The previous measure can be written as,

$$h(\mathbf{M}) = \mathbf{S}_c' \mathbf{M} \mathbf{S}_c.$$

The standard Herfindahl index is typically represented by a matrix $\mathbf{M}$ equal to the identity matrix, $\mathbf{I}$: a pair of establishments is linked if and only if they operate in the same product market. We create other measures of concentration by considering different matrices $\mathbf{M}$ and functions $\alpha(.,.)$. More specifically,

- we consider $\alpha(p,q)$ as the input share of product p into product q to construct a measure of "production-chain" concentration;

- we consider $\alpha(p,q)$ as the intensity of (cross-)patent citations in the United States between product codes p and q (Bloom et al., 2013) to construct a measure of "technology" concentration;

- we consider $\alpha(p,q)$ as the language proximity between product codes p and q to construct a measure of "product similarity" concentration, which could better incorporate similarities as induced by the demand side.

We use these measures $h(\mathbf{M})$ in Section 5.1 and Appendix D.5 to better characterize the concentration of economic activity in treated counties, and we directly use the different functions $\alpha(p,q)$ in Section 5 to identify establishments operating in product or technology markets close to MRP(s).

B.2 Measures of factor productivity

The measures of factor productivity used in Section 5 are taken from Imbert et al. (2022). The following discussion briefly describes the production model and its identification; the reader can refer to Imbert et al. (2022) for details of the implemented strategy.

Environment Consider establishments producing a differentiated variety of good using a CES production function with only two factors, labor and capital.

Let Y and P (resp. y_i and p_i) denote the aggregate output and prices within a product market (resp. for establishment i). We assume that there is monopolistic competition such that demand for the product variety i is,

$$\frac{y_i}{Y} = \left(\frac{p_i}{P}\right)^{-\sigma},$$

where σ captures the substitutability between product varieties. An establishment i produces along

$$y_i = A_i \left[\alpha k_i^{\rho} + \beta l_i^{\rho}\right]^{\frac{1}{\rho}},$$

where $(\alpha, \beta = 1-\alpha, \rho)$ capture factor intensities and factor complementarity. Wages and returns to capital are taken as given.

Estimation There are three important parameters, (σ, α, ρ), which characterize production at the sector level. These parameters can be identified as follows: (i) a factor cost shifter helps identify the degree of substitutability between factors (ρ), (ii) given the estimate for ρ, α and σ can be retrieved through the observation of aggregate factor shares and profits to revenues within a sector.

We briefly describe the first, crucial step of this procedure. Firm-specific relative factor demand verifies:[50]

$$\ln\left(k_i/l_i\right) = \frac{1}{1-\rho}\ln\left(\frac{\alpha}{1-\alpha}\right) + \frac{1}{1-\rho}\ln\left(w/r\right) + \varepsilon_i,$$

where ε_i is a noise, possibly capturing measurement error or firm-specific technology. The parameter ρ can be identified, in the previous equation, by leveraging exogenous variation in relative factor prices across prefectures and across years in order to instrument the relative factor price. Imbert et al. (2022) rely on predicted immigration shocks, constructed from cropping patterns in rural hinterlands. These shocks are exogenous to factor demand in cities, including demand resulting from the presence of MRPs.

Once (σ, α, ρ) are estimated, the main firm-specific measure of productivity used in this paper, Total factor Productivity, is constructed using:

$$A_i = \frac{y_i}{\left[\hat{\alpha} k_i^{\hat{\rho}} + (1-\hat{\alpha}) l_i^{\hat{\rho}}\right]^{\frac{1}{\hat{\rho}}}}.$$

B.3 Registered patents and mark-ups

Patent applications The measures of patenting used in Sections 4 and 5 exploit the bridge constructed by He et al. (2018) to match firms with all patents submitted

[50] One can combine the two first-order conditions of the firm, and show that the optimal factor use verifies:

$$\begin{cases} (1-1/\sigma)\dfrac{\alpha k_i^{\rho}}{\alpha k_i^{\rho} + \beta l_i^{\rho}} p_i y_i = r k_i \\ (1-1/\sigma)\dfrac{\beta l_i^{\rho}}{\alpha k_i^{\rho} + \beta l_i^{\rho}} p_i y_i = w l_i. \end{cases}$$

to the State Intellectual Property Office (SIPO).

There are three categories of patents submitted to SIPO. A patent can be categorized as "design"; this category mostly covers the external appearance of a product. A patent can be categorized as "innovation"; this category covers fundamental innovations either regarding the final product or the means of production. These patents offer significant protection but require to go through a long administrative process. A patent can be categorized as "utility" (utility model patent); this category covers changes in processing, shape, or structure of products. The latter category has no equivalent outside of China; it often acts as a cheap, fast way to protect an idea—possibly with the objective of registering an innovation patent in the longer run. For these reasons, we construct our main "patent" variable as the number of utility and innovation patents registered by establishments in a given county and year.

Measures of markups We measure markups at the firm level using the strategy developed in De Loecker and Warzynski (2012). Intuitively, the markup can be estimated by comparing the growth of a flexible production input to the subsequent growth in output.

Consider an establishment i at time t. The establishment uses the following production technology:

$$y = f(x_1, \ldots, x_N, k, A),$$

where $\{x_1, \ldots, x_N\}$ are variable inputs, k is a dynamic input (i.e., capital) and A is a scalar Hicks-neutral (Total Factor) productivity term. The first-order conditions bring:

$$\varepsilon_i = \frac{\partial f(x_1, \ldots, x_N, k, A)}{\partial x_i} \frac{x_i}{y} = \frac{p}{\lambda} \frac{p_i x_i}{py},$$

where ε_i is the output elasticity to variable input i and λ is the marginal cost of production at a given level of output. Consequently, we can define the markup $\mu \equiv \frac{p}{\lambda}$ and write

$$\mu = \varepsilon_i / \alpha_i,$$

where $\alpha_i = \frac{p_i x_i}{py}$ is the share of expenditures on the variable input i.

We estimate the output elasticity to variable input i, using a control approach. This approach requires two assumptions on function f: (i) that the parameter A enters as a multiplicative term; and (ii) that there is a common set of technology parameters across producers. The estimation is described in De Loecker and Warzynski (2012), and proceeds in two steps. In a first step, we estimate output as a flexible function of inputs (labor, capital, and material). The residual of this estimation maps into the productivity term A. In a second step, we estimate the law of motion for productivity over time.

This procedure allows us to estimate the output elasticity to variable input i, which we transform into a markup by combining it with an estimate $\hat{\alpha}$ for the expenditure share α. This last correction replaces the output by the predicted output thereby cleaning for measurement error in the denominator of the expression for the markup μ.

C Complements to the empirical strategy

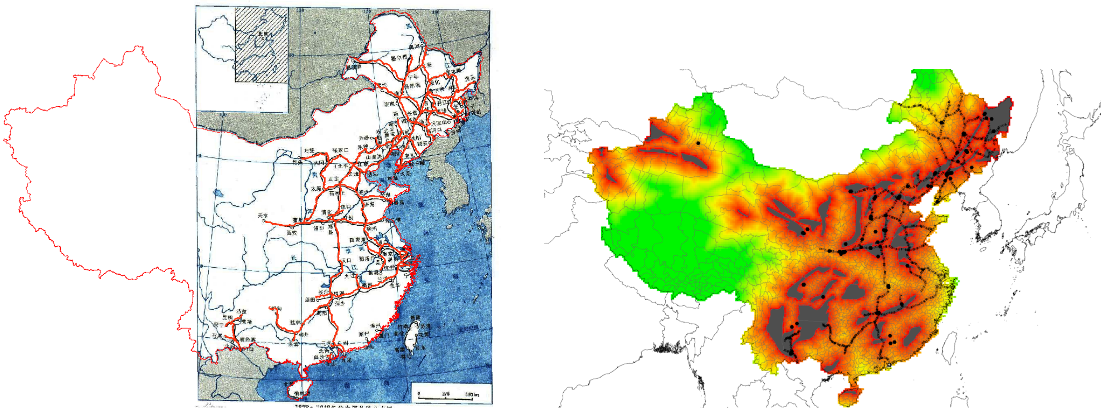
C.1 Matching procedure and complements to the baseline strategy

In this Appendix, we provide a detailed description of the matching procedure used to identify control counties. We first present the variables used for propensity-score matching and as controls, and describe how we construct them. We then provide evidence of common support and the balance of covariates subsequent to matching.

Description of matching and control variables To emulate the planners' siting decisions and identify the control group, we need to construct measures of connectedness to the transportation network and of access to natural resources and markets.

First, we reproduce the transportation network in China at the time of the First Five-Year Plan using the existing railroad network in 1948 (see the left panel of Figure C1), and we construct a measure of proximity to a railroad hub to model connectedness.

Figure C1. Transport network in 1948 and access to natural resources.



A. Transport network in 1948. B. Travel cost to natural resources (coal).

Sources: The left panel is a Railroad Map of China (1948, Joint Intelligence Committee). Black lines are from the original source; red lines are inferred poly-lines using current geocoded railroad lines and cities. The right panel represents the minimum travel cost to coal-bearing areas using the railroad and road networks (red: low travel cost, green: high travel cost). Railroads and roads are geo-located from 1948 and 1962 maps, respectively. Factory locations are indicated with black dots, coal-bearing zones are highlighted with gray areas.

Second, we construct measures of access to raw materials used as inputs by the MRPs: coal, mostly, but also ore and coke deposits. We create a fine grid over China, allowing for different costs of crossing a cell depending on the means of transportation available. We derive the cost of transporting goods on roads by exploiting the road structure in 1962 and assuming the same cost ratio as Glaeser and Kohlhase (2004), who estimate costs of 28 cents per ton mile for trucks and 3 cents per ton mile for rail in the United States at the end of the 20^{th} century. The relative cost of transporting goods through cells that lie neither on a road nor on a railroad line is set at twice the transport cost by truck, which is approximately the average between the truck cost and the cost of transporting goods by wagon relative to train in Fogel (1964). Waterways are omitted from the cost-minimization procedure, as only 2.5% of total freight traffic was carried out by barges (Rong, 2012). We then calculate the minimum travel cost from the closest mineral field for all points through the existing transportation network and collapse it at the county level. The spatial distribution of transport costs to coal fields is displayed in the right panel of Figure C1.

Third, we construct measures of access to markets. We start by mapping the locations of provincial capitals at the time of the First Five-Year Plan using Wikipedia and Baidu Baike. We then use the same cost surface as the one underlying our measures of access to raw materials and calculate the minimum travel cost from each county centroid to the closest provincial capital along the road and railway network.

Fourth, we further include as matching variables (log) county area and (log) population from the 1953 Census.

As our instrument for treatment under the "156" program may coincidentally correlate with the geography of later economic performance, we include in our baseline specification additional controls. These are (log) distance to military airfields and (log) travel cost to sea ports. The latter is defined, for each county, as the minimum cost distance to international sea ports (located using the World Port Index data) through the river network.

Discussion of common support and propensity score Figure C2 shows the distribution of propensity scores in the group of treated counties and the control group (left panel), and the balance of the matching variables used in the baseline strategy, within the whole sample and within the selected sample of suitable counties (right panel).

C.2 Vulnerability to air strikes

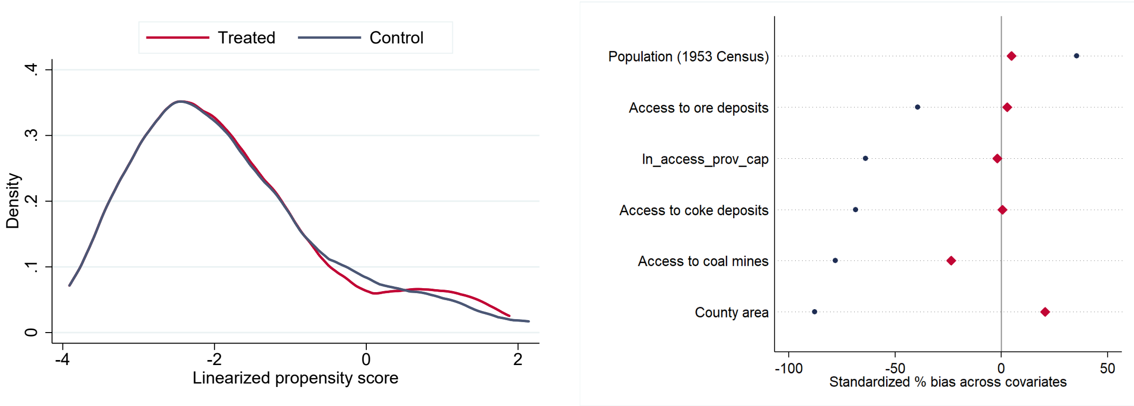
We now describe the procedure to construct our measures of vulnerability to enemy air strikes in different time periods.

Table C1. Description of control variables.

Variables	Description
Population	
Population (1953)	Total population of the county in the First Chinese Population Census (1953).
Access to resources	
Travel cost to coal mines	Distance to coal mines following the 1948 railroad network.
Travel cost to ore	Distance to ore deposits following the 1948 railroad network.
Travel cost to coke	Distance to coke deposits following the 1948 railroad network.
Topographic controls	
Slope (degrees)	Average slope in the county.
Strong slope	Dummy equal to 1 if the average slope is greater than 10 degrees.
Elevation (mean; m)	Average elevation in the county (in meters).
Elevation (st. dev.; m)	Standard deviation of elevation in the county (in meters).
Market access controls	
Travel cost to ports	Dummy equal to 1 for a county whose centroid is lying within 500 km of a port following navigable waterways, and 0 otherwise.
Proximity to courier stations	Dummy equal to 1 if the county centroid is located within 10 kms of the closest Ming-dynasty courier station.
Proximity to 1900 city	Dummy equal to 1 if the county centroid is located within 10 kms of the closest city as of 1900.
Proximity to rivers	Dummy equal to 1 if the county centroid is located within 10 kms of a major river.
Proximity to railway hub	Dummy equal to 1 if the county centroid is located within 5 kms of a railway hub.
Dist. to the coast	Minimum distance to the coast.
Province capital	Dummy equal to 1 if the county belongs to the capital of the province.
Geomorphic controls	
Lake plain	Share of the county's area that consists of lacustrine plains.
Sand hills	Share of the county's area that consists of sand hills.
Tidal marsh	Share of the county's area that consists of tidal marshes.
Agricultural controls	
Expected yield: maize	Average potential yield (kg/ha) of maize under the high-input scenario (GAEZ model-based).
Expected yield: rice	Average potential yield (kg/ha) of rice under the high-input scenario (GAEZ model-based).
Expected yield: wheat	Average potential yield (kg/ha) of wheat under the high-input scenario (GAEZ model-based).
Other geographic controls	
Area	Total land area of the county.
Dist. to military airfields	Minimum distance to a Chinese military airfield.

Allied and enemy air bases over time When the "156" program was being designed, China benefited from the 1950 Treaty of Friendship, Alliance and Mutual Assistance. Not only were the U.S.S.R. and North Korea friendly neighbors; China could count on their protection in case of American or Taiwanese aggression, as

Figure C2. Matching and balance of covariates.



A. Common support (propensity score). B. Balance of covariates.

Sources: The left panel displays the distributions of the propensity score within the set of treated counties (red) and control counties (blue). The right panel shows the bias in covariates in treated counties within the whole sample (blue dots) and the matched sample (red diamonds); all variables are in logarithm.

stipulated by the Treaty.

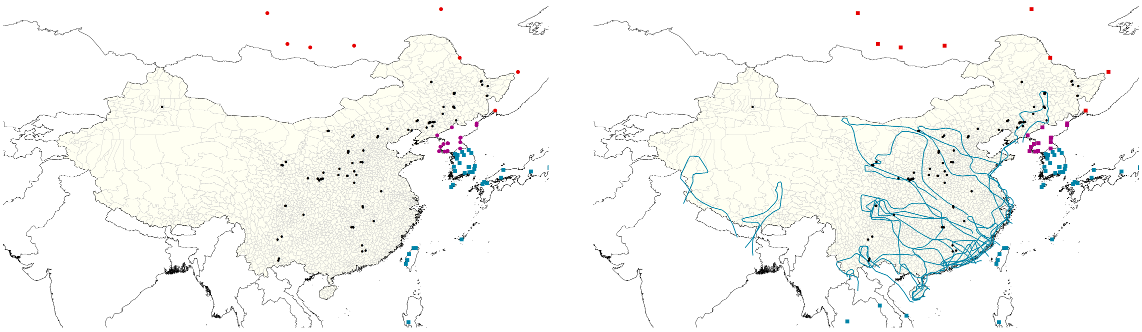
However, we also need to compute measures of vulnerability in later periods. Indeed, vulnerability to U.S. and Taiwanese air strikes at the beginning of the "156" program may be correlated with vulnerability in later periods, which may have motivated spatial policies that affected our outcomes of interest. After the Sino-Soviet split, China no longer enjoyed protection from Soviet and North Korean air bases against American or Taiwanese attacks. These formerly allied air bases now presented a threat. To reflect this new geopolitical situation, we consider not only former American and Taiwanese bases, but also Soviet and North Korean air bases as threats in addition to American air bases that were opened in Vietnam between the beginning of the "156" program and the onset of the Third Front Movement.

We display the distribution of enemy and allied air bases over time in Appendix Figure C3. We also display the surveillance flights from U.S. reconnaissance air flights, as provided by declassified CIA technical intelligence studies. We see that these flights deliberately targeted the MRPs (as is clear from lists of targets, also available from the CIA, that were handed to pilots before each flight), even in the—formerly protected—crescent formed by the Second Front of MRPs.

In the next section, we calibrate a simple model of travel cost to account for the role of allied air bases in shielding some locations in China against aerial attacks.

Flying cost We assume a constant default flying cost over the Chinese territory and model allied air base protection as an additional cost for enemy bombers. This

Figure C3. Distribution of enemy and allied air bases.



A. Pre-1960 split B. Post-1960 split

Notes: This map shows the distribution of enemy and allied air bases in 1953 and in 1964. U.S. air bases are indicated with a green rectangle; North Korean air bases are indicated with a purple circle/rectangle; Soviet air bases are indicated with a red circle/rectangle. In the right panel, we add the paths of surveillance flights between 1963 and 1965. The locations of MRPs are indicated with a dark circle.

penalty is defined as follows:

$$f(d, d') = \underbrace{(1 - e^{-gd'})}_{\text{US adjustment}} \cdot \left(\alpha \frac{e^{a(\bar{x}-d)} - e^{-b(\bar{x}-d)}}{e^{a(\bar{x}-d)} + e^{-b(\bar{x}-d)}} + C \right),$$

where d is distance to the closest allied airbase and d' is distance to enemy air bases, in kilometers. The parameters α and C calibrate the maximum and minimum of the penalty inflicted by allied bases. The dependence of the penalty to distance to allied bases is modeled as a hyperbolic tangent: The penalty vanishes as distance d goes to infinity, increases as d decreases, and reaches a plateau near the airbase. The parameter a (b) disciplines the curvature of the hyperbolic tangent function for low (high) values of d. The inflection point is tied to the value of $\bar{x}$. Finally, the dependence of the penalty to distance to enemy bases is disciplined by g. This parameter determines how the cost paid by enemy bombers for traveling near allied bases is mitigated by the proximity to their own bases.

We calibrate the flying cost as follows. First, we set the key parameters based on declassified CIA technical intelligence documents from the early 1950s.[51] American bombers in the 1950s, like the B-52s, could technically reach any point in China without refueling. However, bombers could be neutralized by interceptors, stationed

[51]Such documents show the information available to U.S. intelligence on Soviet military technology, obtained from spies and through the reverse-engineering of fighter jets downed during the Korean War. We assume perfect information: the Soviet similarly derived information about U.S. military technology, and expected the Americans to know theirs equally well. In keeping with the 1950 Treaty, Soviet military advisers shared their information with their Chinese counterparts, in particular to determine the location of the Million-Rouble plants.

in allied air bases. Declassified CIA documents such as the one reproduced in Appendix Figure C4 provide us with information on the ranges of the main Soviet interceptor (used both in North Korea and the U.S.S.R.), the MiG-15, and the main American jet fighter at the time, the F-86 Sabre. We use the maximum range of the interceptors under "military power" and define $\bar{x}$ as half the maximum range of Soviet interceptors (840 nautical miles or 1,555.68 km—see the table in Figure C4). Note that in addition to the MiG-15, Soviet and North Korean air forces used another interceptor, the Yakovlev. Sources also vary in their accounts of the combat range of the American F-86 Sabre, probably owing to rapid improvements in the aircraft over a short period of time. To take these nuances into account, we test the robustness of our results in Appendix D.1, where we use the different combat ranges available to calibrate the key parameters of the flying cost.

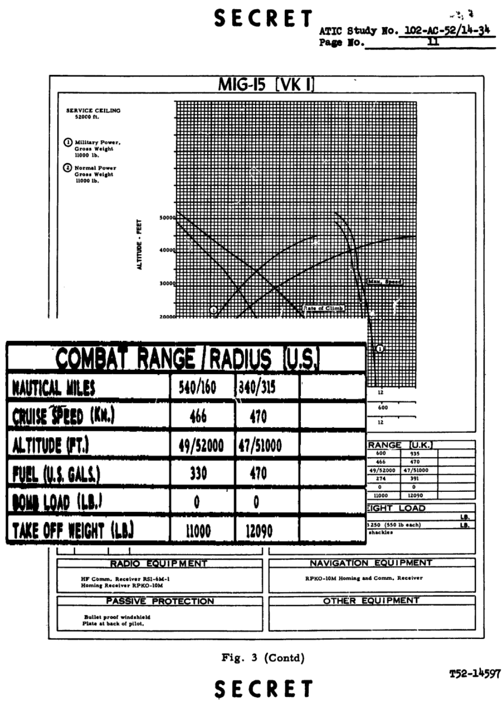
Second, we determine a and b such that 99% of the penalty inflicted by U.S.S.R. and North Korean air bases occurs over the combat range of Soviet interceptors under military power. Similarly, g is set so that 99% of the protection enjoyed by American bombers close to their bases occurs within the combat range of the F-86 Sabre. Finally, α and C are set equal and such that Chinese counties protected by Soviet and North Korean air bases are as safe as remote western counties.

Resulting variation In this section, we briefly describe how the distribution of air bases, combined with the previous parameterization of flying costs, translates into vulnerability maps across Chinese counties.

We define our measure of vulnerability in 1953 as the minimum penalized flying cost to each Chinese county across enemy air bases. For vulnerability after the Sino-Soviet split, we similarly compute minimum travel costs from (all, including U.S.S.R. and North Korean) enemy air bases but without the additional penalty near (formerly) allied air bases. Finally, after 1972 and the U.S.-China *rapprochement*, we consider U.S.S.R. and North Korean air bases as enemies and assume that U.S. air bases are neutral players (since, contrary to the U.S.S.R. between 1950 and 1960, the U.S. never signed a treaty of mutual assistance with China against their common enemy). These different vulnerability measures reflect the changes in geopolitical threats faced by China over the second half of the 20$^{\text{th}}$ century.

As shown in Figure 2 (Panel a), vulnerability to aerial attacks in 1953 favors Northern provinces. This vulnerability, combined with the existing transportation network and coal deposits, draws a crescent from Harbin (Northeast) to Xi'an (Shaanxi province). Most MRPs can be found along this crescent, which forms a "Second Front" in the connected hinterlands. A few MRPs are located in Central

Figure C4. Declassified CIA technical intelligence studies—MiG 15.



Sources: CIA technical intelligence study No. 102-AC-52/14-34, "Soviet Operational Interceptor Aircraft" (3 September 1952).

China, in spite of the high risk of aerial attacks. These few factories however rely on very specific inputs, e.g., tungsten in Jiangxi province, which can only be found in high-risk locations.

In Panel b of Figure 2, we display vulnerability to aerial attacks in 1964 after U.S.S.R. air bases became enemy threats. The set of suitable and protected locations then became small as all counties related to the transportation network are then in the range of enemy bombers. We see, in particular, that some areas that were protected by the Soviet and North Korean allies, such as the Northeast and to a lesser extent counties bordering Mongolia, became extremely vulnerable. Western provinces, removed from both U.S./Taiwanese and Soviet bombing threats, turned out to be the safest. This new vulnerability map rationalizes the Third Front Movement, which targeted interior, remote provinces (see Fan and Zou, 2019).

C.3 Identifying treatment heterogeneity

We aim to estimate the externalities exerted by Million-Rouble plants on manufacturing establishments of the same county, through production linkages, factor market linkages, or technological linkages. For this purpose, we develop an empirical strategy to identify treatment spillovers across establishments in the presence of treatment heterogeneity.

Without treatment heterogeneity, spillovers can be estimated as follows. Consider an establishment i located in county c. We would like to estimate the statistical model $E[Y_i|T_c, S_i]$ where Y_i is the outcome at the establishment level, $T_c \in \{0,1\}$ is the treatment, and $S_i \in \{0,1\}$ characterizes the sub-population of firms susceptible to be affected. The previous statistical model can be estimated through a simple difference-in-differences procedure, in which the instrument for treatment T_c would be interacted with the spillover measure S_i. With treatment heterogeneity, however, the latter cannot be constructed in *control* counties, where $T_c = 0$. Indeed, such a measure would crucially depend on the characteristics of the associated *hypothetical* Million-Rouble Plant. Let $T_c^\tau \in \{0,1\}$ denote the MRP-specific treatment, equal to 1 if county c hosts the MRP indexed by τ, and $T_c = \max_\tau\{T_c^\tau\}$ the average treatment (i.e., hosting at least one MRP). We can define a measure of MRP-specific linkages in all counties, given the characteristics of an establishment and the characteristics of the MRP. We describe next how we attribute hypothetical MRPs to control counties.

Our empirical strategy stratifies control counties by their suitability to host Million-Rouble Plants. We define strata of counties based on the propensity score $P(\mathbf{H}_c)$, as produced by the propensity-score matching procedure described in Section 3 (relying on observable characteristics $\mathbf{H}_c$). In the baseline one-to-one matching, there is one treated county and its associated MRP type in each stratum. We assume that the probability to host any such MRP type τ is the same for the control county in the same stratum. Under this assumption, we can hypothetically allocate the MRPs of the treated county to the matched control county and calculate hypothetical links S_i, using the observed characteristics of establishments in these control counties. We then estimate the following IV specification in difference-in-differences on the sample of all establishments surveyed in year t and located in suitable counties, excluding the MRPs themselves:

$$Y_{isct} = \beta_0 + \beta_1 T_c + \beta_2 T_c \times S_{sct} + \beta_3 S_{sct} + \mathbf{X}_c\beta_{\mathbf{x}} + \mu_{st} + \varepsilon_{isct} \tag{2}$$

where $(T_c, T_c \times S_{sct})$ is instrumented by $(V_c, V_c \times S_{sct})$, and Y_{isct} is measured at the establishment level. The identification relies on the difference between linked and non-linked establishments in treated and control counties, using product market and sector dummies, μ_{st}, to clean for omitted variation across sectors. A similar specification can be estimated replacing S_{sct} by treatment characteristics.

The identification crucially hinges on a weaker version of the Conditional Independence Assumption. The allocation of a certain MRP of type τ needs to be independent of unobserved county characteristics that may directly affect outcome Y, conditional on the propensity score $\tilde{P}(\mathbf{H}_c)$.

D Robustness checks and sensitivity analysis

This section provides complements for the main results of the paper. More specifically, we test for the robustness of the county-level results to variations around the baseline empirical strategy (D.1); and we provide additional results on the structure of production in treated counties (D.2), composition effects and firm entry (D.3), treatment heterogeneity and production linkages (D.4), the concentration of production (D.5), and entrepreneurial values (D.6).

D.1 Identification, specification, and alternative outcomes

This section provides: (i) additional evidence supporting the exclusion restriction assumption; (ii) a sensitivity analysis to specification choices; and (iii) robustness checks with alternative measures of economic activity.

Identification and exclusion restriction Our empirical strategy relies on the following identification hypothesis: vulnerability to enemy airstrikes in the 1950s affects the long-run development of Chinese counties only through the location of MRPs. This exclusion restriction would be violated if vulnerability to enemy airstrikes across counties were correlated with: (i) (first-nature or second-nature) characteristics affecting their economic development at later stages; or (ii) later policies that influenced their growth in the later period.

Table D1. Treatment and vulnerability to aerial attacks (1964, 1972).

	Treatment	
	1964	1972
Penalized distance	0.156	-0.096
	(0.123)	(0.119)
Observations	196	196

Notes: Standard errors are clustered at the level of 2-degree × 2-degree cells. The unit of observation is a county (Administrative level 3). *Penalized distance* is the normalized distance to the main enemy airfields penalized by proximity to allied airfields (in 1964 and in 1972). Extended controls include all matching controls (in log), i.e., travel cost to the provincial capital, population in 1953, county area, travel cost to resources (coal, coke, ore), and additional controls, i.e., matching-pair fixed effects, (log) travel cost to major ports (through the river network), and (log) distance to military airfields.

A crucial argument supporting the exclusion restriction is that vulnerability to enemy airstrikes at the time of MRP siting decisions reflected the ephemeral context between 1950 and 1960, and that geopolitical concerns presiding over the later strategic decisions induced a very different spatial variation across space. We shed light on this assumption in the following two exercises building upon counterfactual "first stages." In Table D1, we replace our instrument by penalized distance to enemy air bases in 1964 (column 1)—after the Sino-Soviet split had thoroughly reshuffled international alliances and subsequently transformed the distribution of vulnerability to aerial attacks across Chinese counties—and in 1972 (column 2)—after Nixon's visit to China initiated a *rapprochement* with Mao's China, against the U.S.S.R. as a common enemy, once again transforming the geography of vulnerability to foreign airstrikes. We do not find that the treatment strongly correlates with the later vulnerability measures that influenced the reallocation of strategic investments to other areas.

Table D2. Vulnerability to aerial attacks (1953) and place-based policies (Third-Front movement and city parks).

	Third-Front	City parks
Penalized distance	0.091	0.063
	(0.024)	(0.178)
Observations	196	196

Notes: Standard errors are clustered at the level of 2-degree $\times$ 2-degree cells. The unit of observation is a county (Administrative level 3). *Penalized distance* is the normalized distance to the main enemy airfields penalized by proximity to allied airfields (in 1953). Extended controls include all matching controls (in log), i.e., travel cost to the provincial capital, population in 1953, county area, travel cost to resources (coal, coke, ore), and additional controls, i.e., matching-pair fixed effects, (log) travel cost to major ports (through the river network), (log) distance to military airfields, and penalized flying cost to enemy airfields in 1964. *Third-Front* is a dummy equal to one if the county is in a province chosen as part of the Third-Front movement (see Fan and Zou, 2019); *City park* is the total number of city parks created between 1980 and 2005 per 10,000 inhabitants (see Zheng et al., 2017)

In Table D2, we instead look at the relationship between vulnerability to aerial attacks in 1950–1960 and later place-based policies that could explain the differential evolution over time between treated and control counties—as observed in Section 4. We regress dummies for (i) receiving investment under the Third Front movement in the 1960-70s (column 1) and (ii) hosting city parks in the Reform era (column 2) on our baseline instrument. While we find that protected counties are not more/less likely to receive place-based investments in the more recent period (city parks), we do find that they are more likely to be in a "Third-Front" province (with possible gains in the longer run, see Fan and Zou, 2019). We thus later provide a robustness check where we condition our baseline estimates on these place-based investments (see Table D4).

We now provide more direct evidence that first- or second-nature characteristics are not responsible for the observed relationship between the treatment and economic development across counties (Table D3). Some first-nature geographical features, e.g., terrain ruggedness, which may have been seen favorably at the time of investment because they offered protection against aerial attacks, may hamper long-run economic development. In Panel A of Table D3, we add the following controls to capture such time-invariant geographic features: elevation (minimum, mean, and maximum), ruggedness (or average slope in the county), pollution measures (NO2 concentration in 2000, 2005, 2010 and 2015), and crop yield (the maximum expected yield between the three most common crops: rice, wheat, and maize). Including these measures does not affect our baseline findings.

Table D3. Sensitivity to the empirical specification—exclusion restriction (first- and second-nature geography).

	Population (1982)	GDP p.c. (1982)	Population (2010)	GDP p.c. (2010)
Panel A: Controls for first-nature geography				
Unfavorable environment	0.644	0.779	0.616	-0.357
	(0.135)	(0.146)	(0.169)	(0.099)
	[160]	[160]	[160]	[160]
Panel B: Controls for second-nature geography				
Distance to the coast	0.626	0.853	0.852	-0.526
	(0.129)	(0.173)	(0.152)	(0.173)
	[196]	[196]	[196]	[196]
Excluding coastal provinces	0.200	0.900	0.705	-0.162
	(0.106)	(0.133)	(0.122)	(0.188)
	[109]	[109]	[109]	[109]
Excluding the Pearl river delta	0.327	0.798	0.569	-0.361
	(0.083)	(0.116)	(0.106)	(0.101)
	[177]	[177]	[177]	[177]
Excluding the South of China	0.418	1.032	0.695	-0.329
	(0.096)	(0.119)	(0.106)	(0.117)
	[159]	[159]	[159]	[159]

Notes: Each cell is the outcome of a separate regression. Standard errors are clustered at the level of 2-degree × 2-degree cells (reported between parentheses). The unit of observation is a county (Administrative level 3); the number of observations is reported between square brackets. The instrument is the distance to the main military U.S. and Taiwanese airfields penalized by the proximity to U.S.S.R. and North Korean airfields. All specifications include (i) matching-pair fixed effects, (ii) matching controls (in log), i.e., travel cost to the provincial capital, population in 1953, county area, travel cost to resources (coal, coke, ore), and (iii) the additional controls, i.e., (log) travel cost to major ports (through the river network), (log) distance to military airfields, and penalized flying cost to enemy airfields in 1964.

Geography may however have shaped the fate of treated and control counties through second-nature determinants and the geography of Chinese growth from 1990 onward: Fast-growing regions are indeed largely located along the coast and in the south, i.e., in regions that were extremely vulnerable to aerial attacks in the 1950s and subsequently received few MRPs. In Panel B of Table D3, we control for (log) distance to the coast to capture a comparative advantage in an exporting economy, we implement a more stringent test by excluding all counties in coastal provinces, we exclude all (mostly control) counties within a 500-km buffer around the Pearl River delta, and we finally exclude all counties south of the 28$^{\text{th}}$ parallel. Although point estimates may vary as we restrict the sample, the boom-and-bust pattern that we identify in our baseline results is remarkably robust.

The relative fall of treated counties may be due to later place-based policies that favored counties in the comparison group, or to severe disruptions due to pre-transition policy shocks in treatment counties. We control for such policies and events in Panel A of Table D4: the 63 completed plants planned within the 2$^{\text{nd}}$ Five-Year Plan (FYP); the Third Front movement (Fan and Zou, 2019), which redirected strategic investments to the Western provinces after the Sino-Soviet split; the Cultural Revolution, which may have disproportionately affected the most socially and economically advanced urban areas; Special Economic Zones and industry parks (Wang, 2013; Crescenzi et al., 2012; Alder et al., 2016; Zheng et al., 2017), the main place-based policy of the Reform era; and the massive investments in transport infrastructures recently carried out, which may have targeted areas with few preexisting (industrial) investments and proxy for contemporary connectedness. Beyond these emblematic policies, the regime could have favored certain counties due to their strategic location, and these further investments may correlate with the vulnerability instrument. We already control for the vulnerability to air strikes in 1964; we separately add the vulnerability to Soviet air strikes in 1972 in the last row of Panel A (Table D4). Neither alternative policies nor alternative measures of vulnerability affect our estimates. Since we do not know of any place-based policy that deliberately compensated control counties for not receiving MRPs, in the Mao era or in the Reform era, these results suggest that the rise-and-fall pattern experienced by treated counties is the effect of the treatment.

The baseline specification does not account for the evolution of MRPs themselves. While we already document the healthy condition of MRPs in recent decades (see Appendix A.4 and Giorcelli and Li, 2022), we further check for the robustness of the results in Panel B of Table D4 when we exclude treated counties with either a closed or displaced MRP, and when we control for military or extractive MRPs, which may have declined with the diversification of the Chinese economy and depletion of their natural resource base, respectively. The results show that the main empirical findings are not explained by the evolution of the MRPs.

Finally, we exploit a placebo treatment in Table D5 where we leverage 35 projects planned during the 2$^{\text{nd}}$ Five-Year Plan but abandoned due to the abrupt end to industrial cooperation between China and the U.S.S.R.. We compare the counties supposed to host these abandoned investments with treated counties (of the 2$^{\text{nd}}$

Table D4. Sensitivity to the empirical specification—exclusion restriction (policies and factory type).

	Population (1982)	GDP p.c. (1982)	Population (2010)	GDP p.c. (2010)
Panel A: Controlling for place-based policies				
2nd Five-Year-Plan plants	0.402	0.702	0.468	-0.341
	(0.085)	(0.108)	(0.109)	(0.110)
	[196]	[196]	[196]	[196]
Third Front Movement	0.421	0.666	0.531	-0.390
	(0.076)	(0.101)	(0.100)	(0.105)
	[196]	[196]	[196]	[196]
Cultural Revolution	0.402	0.712	0.533	-0.378
	(0.073)	(0.100)	(0.097)	(0.095)
	[196]	[196]	[196]	[196]
Special Economic Zones	0.376	0.868	0.599	-0.322
	(0.073)	(0.104)	(0.102)	(0.092)
	[196]	[196]	[196]	[196]
Transport infrastructure	0.414	0.584	0.551	-0.514
	(0.087)	(0.111)	(0.110)	(0.126)
	[196]	[196]	[196]	[196]
Penalized distance in 1972	0.573	1.059	0.892	-0.455
	(0.101)	(0.126)	(0.116)	(0.133)
	[196]	[196]	[196]	[196]
Panel B: Controlling for factory type				
Excluding closed factories	0.436	0.715	0.577	-0.422
	(0.086)	(0.135)	(0.110)	(0.124)
	[176]	[176]	[176]	[176]
Controlling for military factories	0.566	0.922	0.614	-0.413
	(0.125)	(0.180)	(0.159)	(0.169)
	[196]	[196]	[196]	[196]
Controlling for extractive factories	0.639	1.088	0.797	-0.703
	(0.131)	(0.180)	(0.165)	(0.175)
	[196]	[196]	[196]	[196]

Notes: Each cell is the outcome of a separate regression. Standard errors are clustered at level of 2-degree × 2-degree cells (reported between parentheses). The unit of observation is a county (Administrative level 3); the number of observations is reported between square brackets. The instrument is the distance to the main military U.S. and Taiwanese airfields penalized by the proximity to U.S.S.R. and North Korean airfields. All specifications include (i) matching-pair fixed effects, (ii) matching controls, i.e., travel cost to the provincial capital, (log) population in 1953, (log) county area, travel cost to resources (coal, coke, ore), and (iii) the additional controls, i.e., travel cost to major ports (through the river network), distance to military airfields, and penalized flying cost to enemy airfields in 1964.

Five-Year Plan) in 1982 and in 2010, thereby exploiting that these counties were arguably selected in a similar manner as treated counties. The advantage of this specification is that it does not rely on any matching procedure or on the variation

Table D5. Alternative identification strategy: abandoned plants.

	Population (1982)	GDP p.c. (1982)	Population (2010)	GDP p.c. (2010)
Treatment	0.456	0.557	0.645	0.261
	(0.229)	(0.265)	(0.264)	(0.278)
Observations	54	54	54	54

Notes: Each cell is the outcome of a separate regression. Standard errors are clustered at the level of 2-degree × 2-degree cells (reported between parentheses). The unit of observation is a county (Administrative level 3). The regressions are estimated with OLS. The sample consists of counties with a planned Second Five-Year Plan factory. The treatment is equal to 1 if at least one plant was completed and 0 if all plants were abandoned. We exclude four counties that had both completed and abandoned plants.

induced by vulnerability to aerial attacks.

Sensitivity We now test the sensitivity of our main results to various specification choices. We test the robustness of the findings to (a) alternative matching strategies, (b) alternative weights, (c) alternative inference, and (d) reasonable variations in the parameterization of the flying cost used to penalize distance to enemy air bases.

We start by analyzing variation along the baseline specification in Table D6. In Panel A, we run a simple OLS regression with province fixed effects on the whole sample of counties in China.[52] The treatment effects are slightly smaller than in the baseline specification, possibly reflecting spatial spillovers. We then revert to the baseline specification on the sample of counties selected through a matching procedure and: (i) we add proximity to major cities in 1900, proximity to Ming courier stations, distance to military airfields, access to the main trading ports, and distance to the coast (all in log) to the matching process; (ii) we restrict the matching process to a small set of variables, i.e., travel cost to coal mines, population in 1953, and county area (all in log); (iii) we use a many-to-one matching procedure between treated and control counties; (iv) we double the exclusion zone around treated counties (see Section 3); and (v) we exclude matches with a propensity score below the 10th percentile. The main result, i.e., the large difference in GDP per capita in 1982 and the subsequent catch-up, is qualitatively unchanged relatively to the baseline.

In the baseline specification, GDP per capita is imputed for a few counties in 2010. In Panel B of Table D6, we derive the main estimates without any such imputation and use GDP per capita in 2000, which suffers from fewer missing ob-

[52] The identification thus relies on a comparison of treated counties with their immediate neighbors.

Table D6. Sensitivity to the empirical specification—matching and weights.

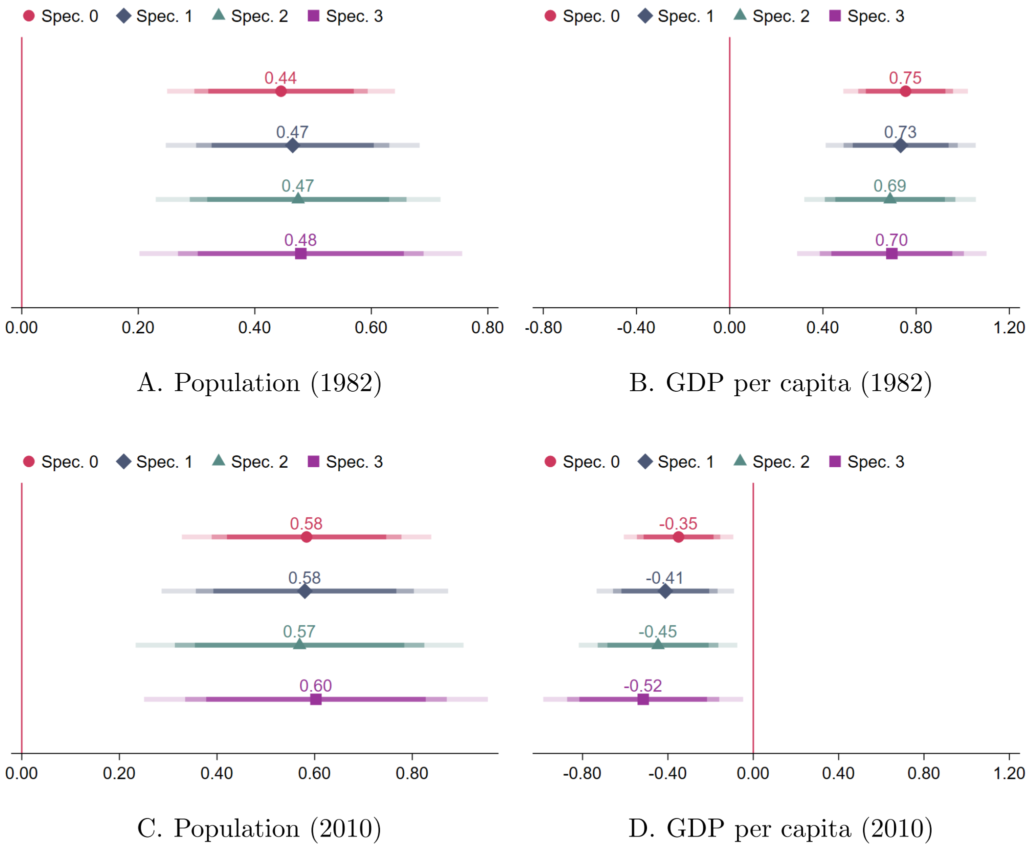
	Population (1982)	GDP p.c. (1982)	Population (2010)	GDP p.c. (2010)
Panel A: Alternative matching				
Local identification	0.194	0.542	0.398	0.121
	(0.039)	(0.068)	(0.059)	(0.062)
	[2407]	[2407]	[2407]	[2407]
More matching variables	0.110	0.342	0.177	-0.048
	(0.064)	(0.082)	(0.061)	(0.095)
	[494]	[494]	[494]	[494]
Fewer matching variables	0.125	0.634	0.086	-0.044
	(0.080)	(0.094)	(0.103)	(0.086)
	[490]	[490]	[490]	[490]
Nearest-neighbor matching	0.206	0.809	0.448	-0.332
	(0.117)	(0.173)	(0.140)	(0.155)
	[751]	[751]	[751]	[751]
Larger exclusion zone	0.111	0.426	0.138	-0.246
	(0.059)	(0.082)	(0.081)	(0.098)
	[494]	[494]	[494]	[494]
Excluding poor matches	0.416	0.765	0.546	-0.249
	(0.076)	(0.109)	(0.102)	(0.095)
	[177]	[177]	[177]	[177]
Panel B: No imputation of missing				
No imputation of missing GDP	0.441	0.722	0.538	0.092
	(0.086)	(0.116)	(0.110)	(0.110)
	[188]	[188]	[188]	[188]
Panel C: Inference				
Coefficient on Treatment	0.448	0.754	0.588	-0.349
SE 2x2-Degree Cluster (baseline)	0.076	0.104	0.098	0.099
SE 3.5x3.5-Degree Cluster	0.080	0.087	0.096	0.099
SE 4x4-Degree Cluster	0.076	0.096	0.108	0.078
SE Province Cluster	0.074	0.097	0.113	0.077
SE Conley (100km radius)	0.072	0.097	0.104	0.097
SE Conley (200km radius)	0.072	0.079	0.078	0.088
SE Conley (300km radius)	0.061	0.090	0.090	0.078

Notes: Each cell is the outcome of a separate regression. Standard errors are clustered at the level of 2-degree × 2-degree cells (reported between parentheses). The unit of observation is a county (Administrative level 3); the number of observations is reported between square brackets in Panels A and B. The instrument is the minimum distance to military U.S. and Taiwanese airfields penalized by the proximity to U.S.S.R. and North Korean airfields. All specifications include (i) matching-pair fixed effects (except the first specification which includes province-fixed effects instead), (ii) matching controls (all in log), and (iii) the additional controls, i.e., (log) travel cost to major ports (through the river network), (log) distance to military airfields, and penalized flying cost to enemy airfields in 1964. In the second row of Panel A, we additionally use proximity to major cities in 1900, proximity to Ming stations, distance to military airfields, access to the main trading ports, and distance to the coast (all in log) as matching variables in order to select the group of control counties. In the third row, we drop access to ore and coke from the (baseline) set of matching variables.

servations, to capture the long-run effect of the MRPs on local productivity.

The baseline inference strategy clusters standard errors at the level of 2-degree × 2-degree cells. In Panel C of Table D6, we reproduce the baseline results but provide: clustered standard errors at d-degree × d-degree cell and at the province levels, as well as standard errors with an arbitrary spatial correlation (following Colella et al., 2019) within 100, 200, and 300 km. The variation in the precision of the estimates is limited across these alternative inference strategies.

Figure D1. Flying cost from enemy air bases in the 1950s—sensitivity analysis.



Notes: The instrument is the minimum distance to U.S. and Taiwanese military airfields penalized by the proximity to U.S.S.R. and North Korean airfields under 4 different specifications. Spec. 0 corresponds to our baseline; it uses the combat range of MiG-15 VK-1 aircrafts to determine the reach of U.S.S.R. interceptors and a combat range of 1,485 km for U.S. interceptors. Spec. 1 uses instead the technical characteristics of the Yakovlev Type-28 for Soviet interceptors. Spec. 2 uses instead a combat range of 1,611 km for U.S. interceptors. Spec. 3 uses both the Yakovlev Type-28 combat range for Soviet interceptors and a combat range of 1,611 km for U.S. interceptors. All specifications include (i) matched-pair fixed effects, (ii) matching controls (all in log), i.e., travel cost to resources (coal, coke, ore), travel cost to the nearest provincial capital, population in 1953, and county area (log), and (iii) the additional controls, i.e., (log) travel cost to major ports (through the river network), (log) distance to military airfields, and penalized distance to enemy airfields in 1964. Each dot represents the coefficient on the variable indicated in the panel title, following different parameterization of the flying cost penalty used to construct the instrument.

Our instrument for hosting a MRP is a measure of penalized flying cost from enemy air bases in the 1950s. As explained in Appendix C.2, we set the key parameters governing this flying cost using declassified CIA technical intelligence documents from the early 1950s. Sources however differ slightly about the characteristics of the American F-86 interceptor, and although the main Soviet interceptor was the MiG-15, another aircraft, the Yakovlev, was sometimes used. This grants us some freedom in choosing the key combat ranges and thus the parameters that they govern. We test the robustness of the results to such choices in Figure D1, where we retain the functional form assumption but use different combat ranges to calibrate "free" parameters ($\bar{x}$, a, b, and g, following the notation of Appendix C.2).

Table D7. Sensitivity to other measures of economic development.

	Participation	Illiteracy	Gender ratio
Panel A: Additional census variables			
Treatment effect (1982)	-0.024	-0.162	-0.026
	(0.006)	(0.016)	(0.007)
	[196]	[196]	[196]
	Agriculture	**Industry**	**Services**
Panel B: Precise sectoral decomposition (employment shares)			
Treatment effect (1982)	-0.295	0.140	0.151
	(0.047)	(0.024)	(0.023)
	[196]	[196]	[196]
Treatment effect (2010)	-0.088	-0.009	0.096
	(0.044)	(0.028)	(0.028)
	[196]	[196]	[196]
	Expenditures	**Revenues**	**Savings**
Panel C: Local governments			
Treatment effect (2010)	0.434	0.173	0.027
	(0.158)	(0.248)	(0.246)
	[99]	[99]	[98]

Notes: Each cell is the outcome of a separate regression. Standard errors are clustered at the level of 2-degree × 2-degree cells (reported between parentheses). The unit of observation is a county (Administrative level 3); the number of observations is reported between square brackets. The instrument is the minimum distance to U.S. and Taiwanese military airfields penalized by the proximity to U.S.S.R. and North Korean airfields. All specifications include (i) matching-pair fixed effects, (ii) matching controls (all in log), i.e., travel cost to the provincial capital, population in 1953, county area, and travel cost to resources (coal, coke, ore), and (iii) the additional controls, i.e., (log) travel cost to major ports (through the river network), (log) distance to military airfields, and penalized flying cost to enemy airfields in 1964.

Measurement The baseline specification shows a rise-and-fall pattern in GDP per capita at the county level. We now complement these findings with alternative measures of economic development. In Panel A of Table D7, we extract a few additional variables from the 1982 Census, i.e., the labor force participation, illiteracy rate, and male-to-female ratio. The illiteracy rate is much lower in treated counties (16 percentage points). There are no sharp differences in the male-to-female ratio, which shows that selected immigration, if any, was not strongly tilted toward males. In Panel B, we shed additional light on the nature of the rise-and-fall pattern: we document the allocation of workers across sectors in 1982 and 2010. The observed difference in household registration (see Table 4) does reflect a difference in employment shares across sectors of the local economy: the employment share in agriculture is almost 30 percentage points lower in treated counties. The "released" labor force is equally absorbed by industry and services. In particular, a significant share of workers in the service sector are allocated to distribution and transportation (results not shown), two sub-sectors very likely to intervene in the production chain of a MRP. The magnitude of these estimates is large: the local allocation of workers in treated counties resembles the aggregate Chinese economy after the transition. In 2010, however, treated counties are slightly less industry-intensive, a result mostly explained by a higher prevalence of services (distribution and transportation). In Panel C, we analyze the role of government expenditures and revenues. We do find an impact on local government expenditures in 2010, but not so much on government revenues—possibly reflecting a combination of lower economic activity and lenient local taxation. The discrepancy between expenditures and revenues can only be sustained temporarily, or it would strongly affect the asset position of local governments. We do not find large differences in savings, which indicates that the gap appeared rather recently.

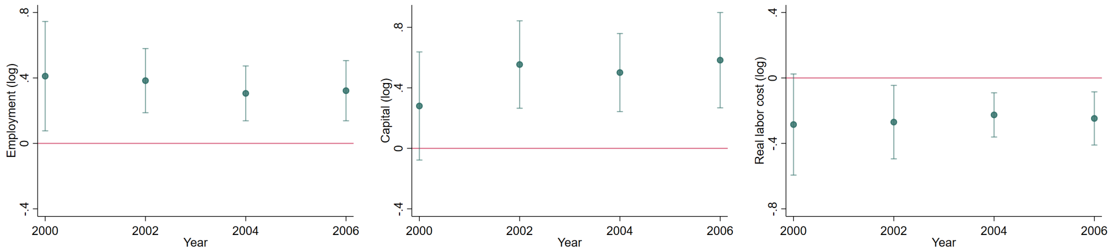
D.2 Sensitivity analysis on the structure of production in treated counties

In this section, we provide a sensitivity analysis of our baseline findings on the structure of production in treated counties (Table 5).

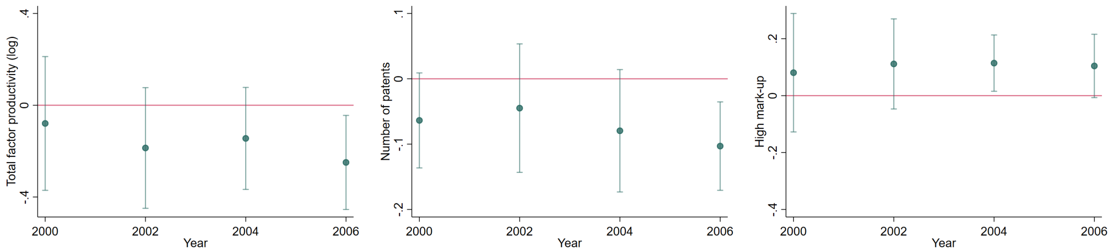
In a first step, we study the *dynamic* treatment effects for other establishments than MRPs. More precisely, we estimate the treatment effect using Specification (1) at the establishment level in different years, and we report the results in Figure D2. These results are obtained with the full set of fixed effects used in Table 5 to control for the slow demise of public enterprises and time variation in sectoral returns. As apparent from Figure D2, the average other establishment remains larger in treated counties over the period, and labor cost remains quite stable, as does markup (Panels C and F). Finally, the differences in productivity and patenting behavior between treated and control counties materialize after 2000 (Panels D and E).

In a second step, we look at the role of composition effects in explaining the

Figure D2. The dynamics of other establishments in counties hosting MRPs.



A. Employment B. Capital C. Labor cost



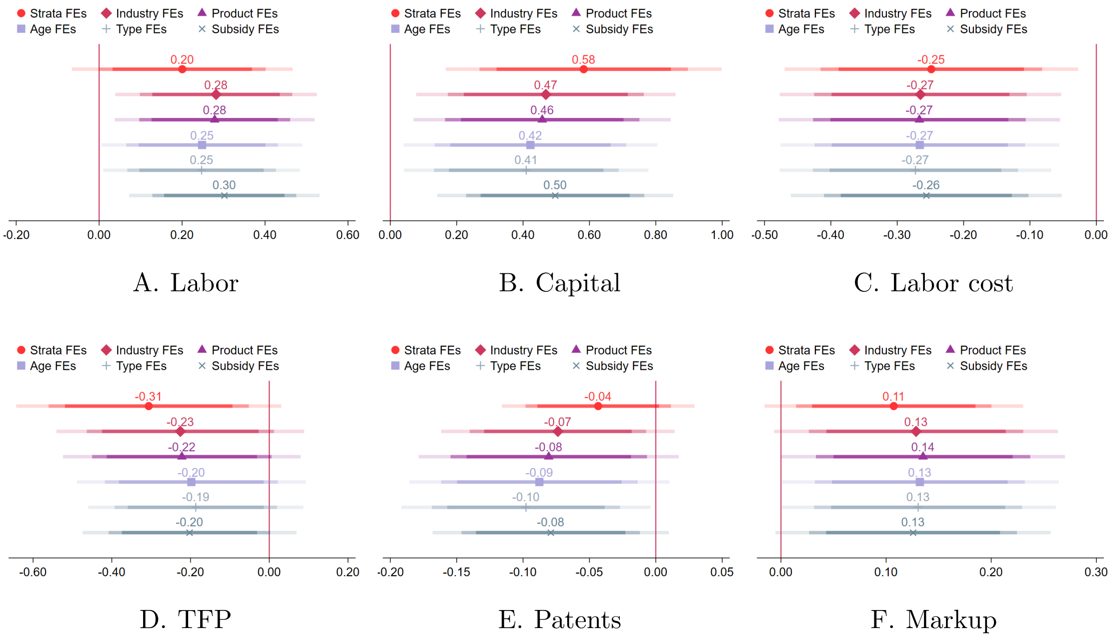
D. Total Factor Productivity E. Patents F. Markup

Notes: Panels A-F display the treatment effect for the main outcomes of Table 5: employment; real capital; real labor cost; a measure of total factor productivity at the establishment level, identified using an exogenous labor supply shifter (see Imbert et al., 2022, and Appendix B.2); registered patents (He et al., 2018); and markups computed following De Loecker and Warzynski (2012). We estimate Specification (1) at the establishment-level, separately for each year between 2000 and 2007, and report the "yearly" treatment effect.

estimates provided in Table 5. In Figure D3, we include the extended controls of Table 5 in succession: match-strata fixed-effects in the first specification; then adding industry fixed effects (interacted with year); then adding product fixed effects; then adding age fixed effects; then adding firm type fixed effects; then adding a dummy for receiving public subsidies. The last set of estimates is our baseline regression. We find that the treatment effects are mostly robust to controlling for: (i) the industrial fabric in treated counties (industry and product), (ii) the life-cycle of firms (age), and (iii) the demise of public establishments in China (firm type).

In a third step, we provide a comprehensive analysis of factor use, factor productivity, firm characteristics, patenting behavior, investment, and subsidies in the average establishment. We report in Table D8 the average treatment effect on factor productivity (Panel A), firm type and characteristics of the workforce (Panel B), cashflows, subsidies, and investment (Panel C), factor intensity (Panel D), patenting (Panel E), markups (Panel F), and firm expenditures usually related to corruption (Panel G; see Cai et al., 2011). The first and last columns of Panel A are already discussed in the main text. In addition, we find that labor productivity is slightly lower in treated counties (not statistically significant) but not as pronounced as

Figure D3. Structure of firm production in the average other establishment—robustness to compositional effects.



Notes: This Figure displays the treatment estimates for the outcomes of Table 5. *Labor* is the logarithm of the number of workers; *Capital* is the logarithm of real capital; *Labor cost* is the logarithm of total compensation per employee; *TFP* is the logarithm of firm-specific total factor productivity as computed in Imbert et al. (2022); *Patents* is the number of patent applications registered by the firm; *Markup* is a dummy equal to one if the markup is above-median within a 4-digit industry $\times$ year cell, computed following De Loecker and Warzynski (2012)—see Appendix B. The unit of observation is a firm $\times$ year, we exclude the MRPs from the sample, and standard errors are clustered at the level of 2-degree $\times$ 2-degree cells. The different specifications include the extended controls of Table 5 in succession: match-strata fixed-effects in the first specification; then adding industry fixed effects (interacted with year); then adding product fixed effects; then adding age fixed effects; then adding firm type fixed effects; then adding a dummy for receiving public subsidies.

the drop in labor cost; capital productivity and TFP are also lower than in control counties. Next, we characterize the establishment "type" in treated counties, specifically whether the average establishment is more likely to be publicly owned, older, and biased towards a more educated workforce. Panel B of Table D8 shows that manufacturing establishments are more likely to be publicly-owned, and more likely to be older than three years; these effects are however small. The composition of the workforce markedly differs between treated and control counties: the average employee in treated counties is *much* more likely to be a skilled worker, but less likely to occupy a "senior" position within the firm (the effect is to be compared with the 28 percentage points share of senior workers). In view of this observation, our finding that wages are lower in treated counties could be puzzling, and this finding is inconsistent with an explanation based on under-investment in human capital (Franck and Galor, 2021). We describe the financing structure of establishments in treated counties, their investment, and the expenditures devoted to R&D

Table D8. Structure of firm production in the other establishment (detail).

	Labor cost	MPL	MPK	TFP
	(1)	(2)	(3)	(4)
Panel A: Factor productivity				
Treatment	-0.265	-0.031	-0.238	-0.145
	(0.074)	(0.083)	(0.120)	(0.093)
Observations	309,167	309,167	309,167	309,167
	Public	Young	Emp. (skilled)	Emp. (senior)
	(1)	(2)	(3)	(4)
Panel B: Firm characteristics (public ownership, unions, employment structure)				
Treatment	0.076	-0.033	0.108	-0.063
	(0.040)	(0.041)	(0.031)	(0.031)
Observations	309,323	309,323	27,660	14,639
	Subsidies	Cash inflow (fin.)	Investment ST	R&D expenses
	(1)	(2)	(3)	(4)
Panel C: Financing, Investment, R&D and technology				
Treatment	0.002	-0.013	-0.032	-0.039
	(0.011)	(0.040)	(0.031)	(0.026)
Observations	227,529	227,529	190,365	190,365
	Human capital	Physical capital	Land	
	(1)	(2)	(3)	
Panel D: Factor intensity				
Treatment	0.017	0.037	0.127	
	(0.017)	(0.046)	(0.034)	
Observations	286,932	286,932	286,932	
	Design	Utility	Invention	All
	(1)	(2)	(3)	(4)
Panel E: Patents				
Treatment	-0.059	-0.016	-0.009	-0.079
	(0.037)	(0.016)	(0.013)	(0.034)
Observations	309,167	309,167	309,167	309,167
	Markup (A,m)	Markup (A,l)	Markup (B,m)	Markup (B,l)
	(1)	(2)	(3)	(4)
Panel F: Markups				
Treatment	0.125	0.087	0.104	0.155
	(0.050)	(0.055)	(0.044)	(0.053)
Observations	196,022	153,222	162,967	127,003
	ETC (level)	ETC (standardized)	ETC (log)	ETC (any)
	(1)	(2)	(3)	
Panel G: Entertainment and travel costs as share of revenue				
Treatment	-0.067	-0.016	-0.054	-0.096
	(0.082)	(0.020)	(0.024)	(0.037)
Observations	37,160	37,160	37,160	37,160

Notes: Standard errors are clustered at the level of 2-degree × 2-degree cells. All specifications include the baseline controls (Table 4, including matching-pair fixed effects interacted with year fixed effects), 4-digit industry × year fixed effects, 6-digit product × year fixed effects, firm type × year fixed effects, firm age × year fixed effects, and a dummy for receiving subsidies × year fixed effects (except Panels B and D, in which we omit firm type × year fixed effects and 4-digit industry/6-digit product × year fixed effects, respectively). *Labor cost* is the logarithm of total compensation per employee; *MPL* (resp. *MPK*, *TFP*) is the logarithm of firm-specific labor productivity (resp. capital, total factor productivity) as computed in Imbert et al. (2022). *Public* and *Young* are dummies equal to 1 if the firm is a state-owned enterprise, and is younger than 3 years. All variables of Panel C are dummies equal to 1 if the associated accounting variable is positive. Factor intensities are the (log) factor intensities, as predicted by the 4-digit product code (following the classification of Shirotori et al., 2010). *Markup* (m) (resp. l) is a dummy equal to one if the markup is above the median within a 4-digit industry × year cell (resp. the log. markup), computed following De Loecker and Warzynski (2012)—see Appendix B. Panel G displays the "entertainment and travel costs" used by managers (ETC) as a percentage of total revenue in col. 1. We standardize this variable in col. 2, take its logarithm in col. 3, and dichotomize it in col. 4; information on ETC is available only in 2004.

in Panel C. The patterns from this analysis do not support a story based on political favoritism (Chen et al., 2017; Fang et al., 2018): public subsidies appear to be non-significantly higher in treated counties (see column 1). The results are inconsistent with privileged access to resources (Harrison et al., 2019): total liabilities are not higher than in control counties (column 2); short-term investment is not lower (see column 3). The financing structure in the average (other) establishment in treated counties appears to be quite similar to that of control counties.

We characterize production in treated counties using product codes at the 6-digit level in Panel D. We regress the (log) factor intensity, as predicted by the 6-digit product code (following the classification of Shirotori et al., 2010), on the treatment T_c, instrumented by V_c. In this specification, we omit year interacted with 4-digit industry and product fixed-effects. The average product in treated counties is relatively human-capital-intensive, physical-capital-intensive, and land-intensive. These findings point toward some specialization of treated counties in capital-intensive production, but the extent of such specialization remains moderate.

We turn to the more direct analysis of technological innovation through the analysis of patent applications across establishments (Panel E). We distinguish three categories: design, innovation, and utility. We find that establishments in treated counties produce fewer patents: -0.059 (design), -0.016 (invention) and -0.009 (utility), -.079 (all). These effects are of the order of magnitude of the yearly number of patents produced in the average establishment: very few patents are registered in treated counties.

We now turn to the analysis of markups across establishments. We rely on a trans-log specification for the production function and consider two main strategies: A (without inputs in the control function) and B (using direct materials as inputs in the control function). For both strategies, we construct two measures for markups: a dummy equal to one if the markup is above the median within a 4-digit industry $\times$ year cell (m) and the (log) markup (l). As shown in Panel F, markups are higher in treated counties across these different specifications.

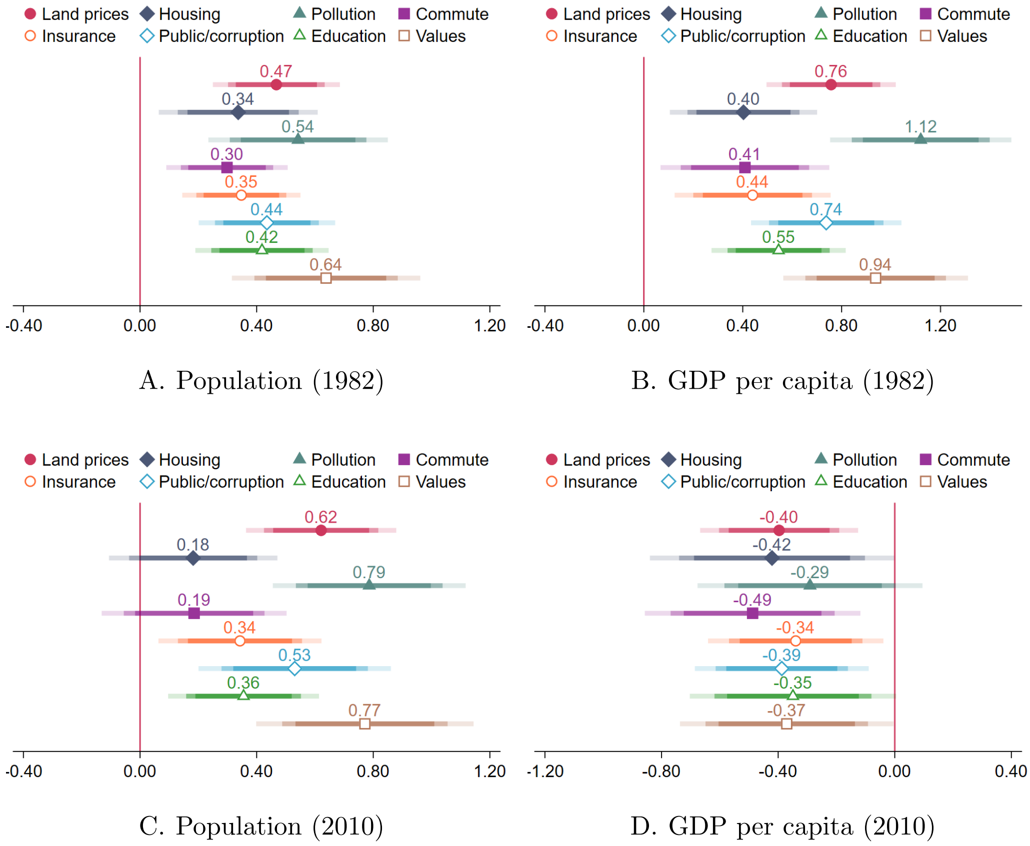
Finally, we explore in Panel G possible differences in "entertainment and travel costs" (ETC) across counties, as a proxy for the local incidence of corruption. We use different measures to normalize these ETC, without finding any positive treatment effects. If anything, entertainment and travel costs are lower in treated counties.

D.3 Dutch disease, local politics, SOEs, and other confounding aggregate factors

In Section 5.4, we discuss alternative mechanisms behind the deterioration of the local business environment. These competing channels are: the allocation of factors (labor, credit, land) across production facilities in treated and control counties; the local political environment; and the role of confounding macroeconomic factors.

In a first step, we show the robustness of our results (Table 4) to controlling for land and housing supply, urban (dis)amenities, the incidence of the public sector

Figure D4. The mitigating role of land markets, housing, amenities, the public sector, education and values.



Notes: All specifications include (i) matched-pair fixed effects, (ii) matching controls (all in log), i.e., travel cost to resources (coal, coke, ore), access to the provincial capital, population in 1953, and county area, (iii) the additional controls, i.e., (log) travel cost to major ports (through the river network), (log) distance to military airfields, and penalized distance to enemy airfields in 1964, and extended sets of controls. We report the main estimates for 8 sets of extended controls: land prices (residential, industrial, commercial) from the registry of auctioned land (1998–2018); housing characteristics (share of homeless people, share of residents in dorms, average dwelling size, share of dwellings constructed before 1990, share of subsidized housing) from the 2015 1% Population Survey; pollution (average NO2, PM10, PM2.5 concentration, 2014–2020) from the China National Environmental Monitoring Center (CNEMC); share of residents using public commuting facilities and average commute time from the 2015 1% Population Survey; shares of workers covered by social insurance and medical insurance from the 2015 1% Population Survey; share of public establishment and average ratio of entertainment costs to revenue from the NBS survey (1998–2008); shares of residents with a high-school degree and with a college degree from the 2015 1% Population Survey; and values (coded from 1 to 5: "Hard work is critical for success," "Connection is critical for success," "Network is more important than ability," "Important to become rich," "Inequality is desirable," and "Fair competition is necessary for harmony") and pre- and post-Revolution elites (the percentage of Communist Party members, the percentage of pre-Revolution elites, i.e., individuals whose households were labeled as "landlords," "rich peasants", "capitalists," or "enterprise owners" at the time of the Communist Revolution, and the percentage of post-Revolution elites, i.e., individuals from households with at least one Communist Party member in the 1940–1965 birth cohorts—see Alesina et al., 2020) from the China Family Panel Survey (CFPS).

(in housing, or in production), corruption, education, and values across treated and control districts. Figure D4 shows that indirect effects passing through land markets or through urban (dis)amenities cannot explain our findings: the large and swift decrease in output is observed even when controlling for the price of land, housing characteristics, pollution, or commuting facilities. Conditioning the analysis on the incidence of the state sector in production or in housing supply is also innocuous: our main finding is not explained by derelict, subsidized housing or by the demise of State-Owned Enterprises. Finally, human capital, values, and the local political environment (education, the intensity of "Communist values," or the shares of pre- and post-Revolution elites, from Alesina et al., 2020) do not appear to be a major mitigating factor.

Table D9. Characteristics of establishments along the production chain of MRPs.

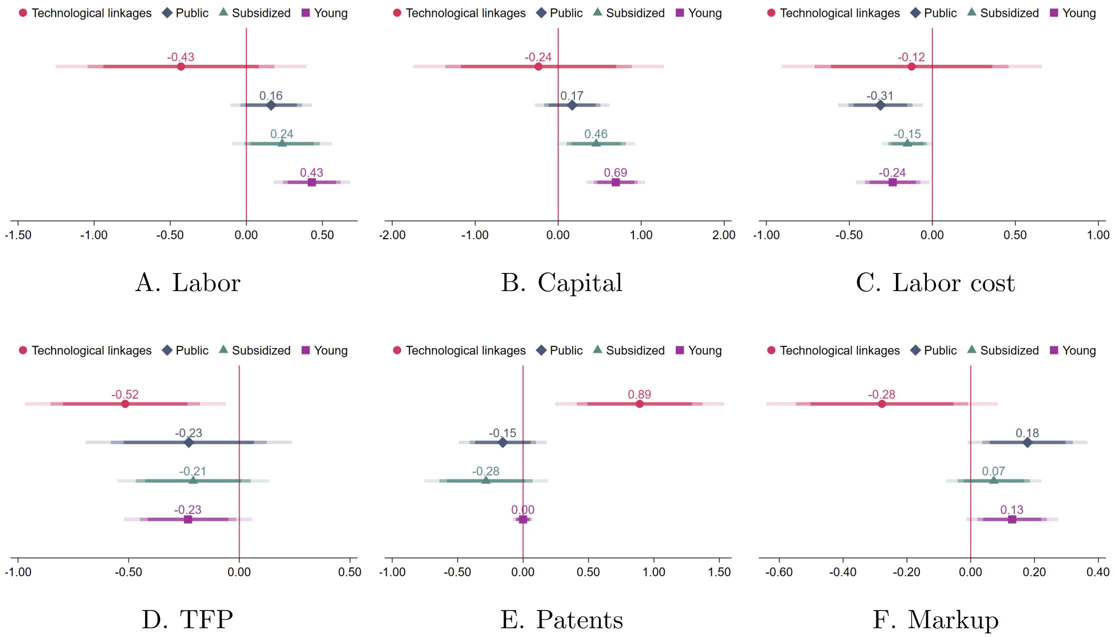
	Public	Subsidized	Young	Entry	Exit
	(1)	(2)	(3)	(4)	(5)
Panel A: All firms					
Treatment	0.076	-0.124	-0.032	0.034	-0.005
	(0.040)	(0.033)	(0.040)	(0.008)	(0.012)
Observations	304,305	304,305	304,305	304,305	304,305
Panel B: Production links					
Treatment	-0.018	0.001	0.063	0.038	0.088
	(0.065)	(0.089)	(0.123)	(0.028)	(0.057)
Observations	23,980	23,980	23,980	23,980	23,980

Notes: Standard errors are clustered at the level of 2-degree × 2-degree cells. The unit of observation is a firm × year. We exclude the MRPs from the sample. All specifications include the baseline controls (Table 4, including matched-pair fixed effects interacted with year fixed effects), 4-digit industry × year fixed effects, and 6-digit product × year fixed effects. *Production links* is the sample of firms operating along the production chain of local MRP(s).

In a second step, we focus on business dynamics and the role of the state in production. More specifically, we document in Panel A of Table D9 the prevalence of public firms, subsidized firms, young firms, firm entry, and firm exit in treated counties by running the baseline specification of Table 5 with respective dummies as dependent variables (and no fixed effects for the different firm types, age, or subsidized firms). We find that the average other establishment in treated counties is different from the average establishment in control counties: these firms are more likely to be public and less likely to be subsidized. By contrast, the average treatment effect on firm age or exit is small.

Panel B of Table D9 provides a more subtle insight into the (slow) dynamics of production in treated counties by looking at the (heterogeneous) effects through the production chain of MRPs. To do so, we restrict the sample to establishments operating downstream of, operating upstream of, or producing the same products as local MRP(s) (hypothetically so in control counties—see Appendix C.3). We find that the production chain of MRPs is not more likely to be public, to be older, or to receive subsidies. However, these establishments are more likely to exit.

Figure D5. Productivity, innovation, and pricing in establishments with other characteristics.



Notes: This Figure displays the treatment estimates for the following outcomes: *Labor* is the logarithm of the number of workers; *Capital* is the logarithm of real capital; *Labor cost* is the logarithm of total compensation per employee; *TFP* is the logarithm of firm-specific total factor productivity as computed in Imbert et al. (2022); *Patents* is the number of patent applications registered by the firm; *Markup* is a dummy equal to one if the markup is above-median within a 4-digit industry × year cell, computed following De Loecker and Warzynski (2012)—see Appendix B. The unit of observation is a firm × year, we exclude the MRPs from the sample, and standard errors are clustered at the level of 2-degree × 2-degree cells. All specifications include the extended controls of Table 5. In each panel, we report four estimates: one obtained using the sample of firms linked through technology (*Technological linkages*); one obtained using the sample of public firms (*Public*); one obtained using the sample of subsidized firms (*Subsidized*); and one obtained using the sample of firms that are younger than 3 years old (*Young*).

In a third step, we quantify whether the previous composition effects may explain the different production structure observed within the average establishment of treated counties. To do so, we look at treatment effects across subsamples of public, subsidized, and young firms and report the estimates in Figure D5. We find that treatment effects on our main outcomes are quite comparable across the latter categories of production units (public, subsidized, or young firms). These findings, coupled with the analysis described in Section 5.4 and Appendix D.2, show that the rise and the fall of treated counties cannot be driven by the demise of the public sector or a misallocation of public subsidies. We do however find differences for firms that are technologically linked to MRPs: these firms tend to be small and unproductive but very active in patenting; they nonetheless represent too small a fraction of total innovation to matter in the local economy.

Table D10. Production linkages with the MRPs—sensitivity analysis.

	Downstream		Upstream		Same product
	(1)	(2)	(3)	(4)	(5)
Treatment (unweighted)	0.079	0.035	0.027	0.067	0.068
	(0.026)	(0.027)	(0.039)	(0.024)	(0.025)
Observations	304,305	304,305	304,305	304,305	304,305

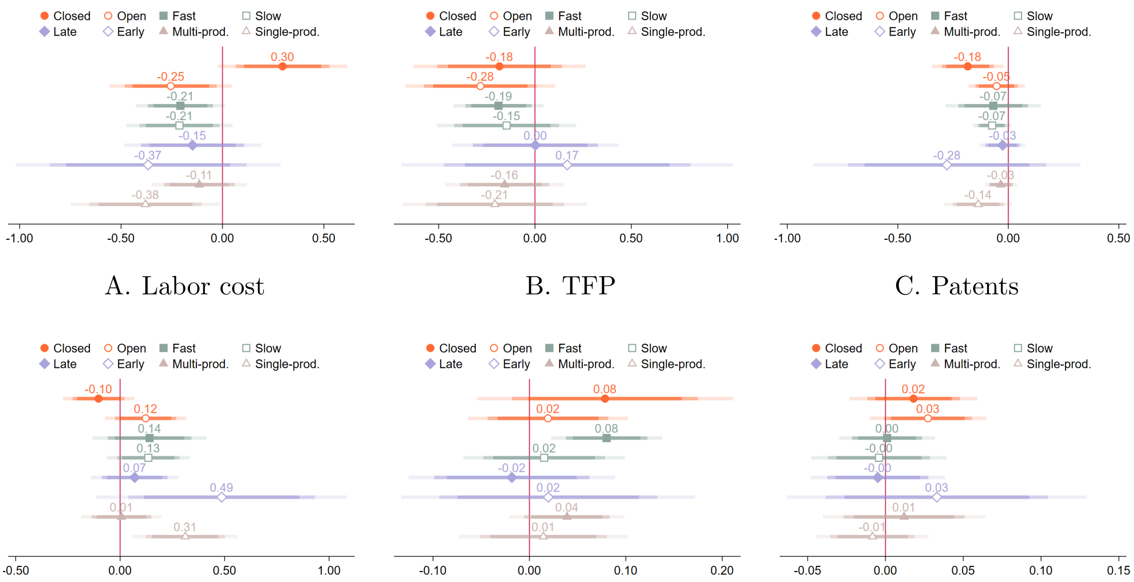
Notes: The unit of observation is a firm × year, we exclude the MRPs from the sample, and standard errors are clustered at the level of 2-degree × 2-degree cells. All specifications include the baseline controls of Table 5. *Downstream* (resp. *Upstream*) is a dummy equal to one if the firm is down (resp. up) the supply chain with respect to one of the 156 factories; *Same product* is a dummy equal to one if the firm is in the same product market as one of the 156 factories (see Section 5 for a description of the empirical strategy and the definition of these dummies in control counties). In columns (1) and (3), a link between the firm and the local MRP(s) is detected if the input/output intensity between the two product categories is in the top quartile; in columns (2) and (4), a link between the firm and the local MRP(s) is detected if the input/output intensity between the two product categories is in the top decile (we select a 5% threshold in the baseline specification—see Table 6). In column (5), we define a horizontal link if the firm and the MRP belong to the same 2-digit industry (we define industries at the 4-digit level to create the *Same product* indicator variable in the baseline specification—see Table 6).

D.4 Treatment heterogeneity and production linkages

In this section, we provide a sensitivity analysis of Sections 5.1 and 5.2. We first produce a robustness check for Panel A of Table 6 in Table D10. In our baseline analysis, a link between the firm and the local MRP(s) is detected if the input/output intensity between the two product categories is in the top 5% or a firm produces the same product if its 4-digit industry is the same as the MRP(s). In Table D10, we look at the incidence of production linkages when a link between the firm and the local MRP(s) is detected if the input/output intensity is in the top quartile—columns (1) and (3)—or in the top decile—columns (2) and (4). We further define a horizontal link if the firm and the MRP belong to the same 2-digit industry—see column (5).

We then explore treatment heterogeneity by estimating treatment effects across other MRP characteristics than those used in Section 5.2. More specifically, we divide the sample of establishments depending on: (i) whether the MRP is still operating at the same location [*Closed*/*Open*], (ii) whether the time spent to construct the MRP(s) is above/below the median [*Fast*/*Slow*], (iii) whether the time at which the construction of the MRP(s) was completed is above/below the median [*Late*/*Early*], and (iv) the variety of products offered by the local MRP(s) [*Multi-prod.*/*Single-prod.*]. We report these estimates for six main outcomes: labor cost (Panel A of Figure D6); Total Factor Productivity (Panel B); patents (Panel C); markup (Panel D); the incidence of production links (aggregating downstream, upstream, and "horizontal" linkages, see Panel E); and the incidence of technological

Figure D6. Treatment heterogeneity across MRP characteristics—other MRP characteristics.



A. Labor cost B. TFP C. Patents

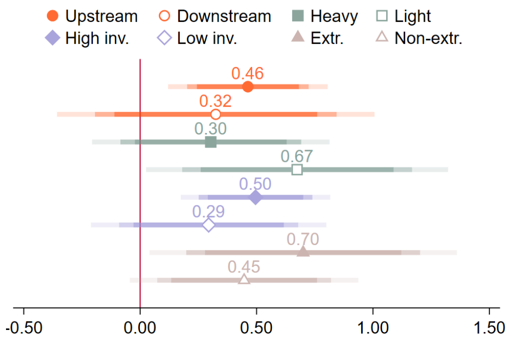
D. Markup E. Production links F. Technological links

Notes: This Figure displays the treatment estimates for the following outcomes: *Labor cost* is the logarithm of total compensation per employee; *TFP* is the logarithm of firm-specific total factor productivity as computed in Imbert et al. (2022); *Patents* is the number of patent applications registered by the firm; *Markup* is a dummy equal to one if the markup is above-median within a 4-digit industry × year cell, computed following De Loecker and Warzynski (2012)—see Appendix B; *Production links* is a dummy equal to one if the firm operates along the production chain of local MRP(s); *Technological links* is a dummy equal to one if sectors in which the establishment and the MRP(s) operate are linked through patent applications. The unit of observation is a firm × year, we exclude the MRPs from the sample, and standard errors are clustered at the level of 2-degree × 2-degree cells. In each panel, we report four set of estimates, focusing on: (i) whether the MRP is still operating at the same location [*Closed*/*Open*], (ii) whether the time spent to construct the MRP(s) is above/below median [*Fast*/*Slow*], (iii) whether the time at which the construction of MRP(s) finished is above/below median [*Late*/*Early*], and (iv) the variety of products offered by the local MRP(s) [*Multi-prod.*/*Single-prod.*].

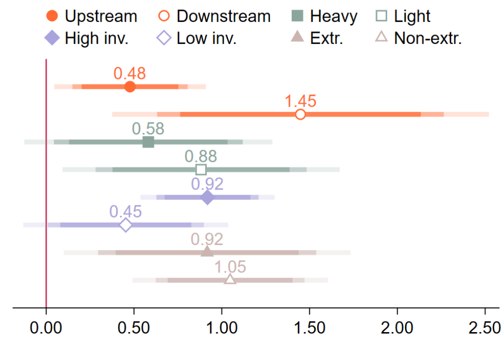
links (see Panel F). There are three key take-away messages from this analysis. First, the negative impact of MRP(s) on the other establishments is observed in counties where MRP(s) are still active and not only where the plants were closed. In some respects, these latter counties even appear to fare better than the others. Second, the timing and duration of construction do matter (as discussed in Giorcelli, 2019, later investments may have suffered from the unexpected Sino-Soviet split) but not hugely so. Third, the average other establishment is less innovative and less competitive in counties where MRP(s) are specialized in one product only.

We finally assess the sensitivity of the heterogeneity analysis based on aggregate county outcomes. We first report in Figure D7 the same dichotomies used in Figure 7 but for the following outcomes: county-level population in 1982 and 2010 (Panels A and B); and county-level GDP per capita in 1982 and 2010 (Panels C and D). We then report in Figure D8 the dichotomies used in Figure D6 for the county-level

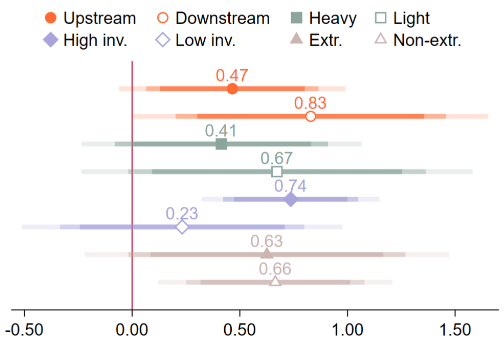
Figure D7. Treatment heterogeneity across MRP types—county results.



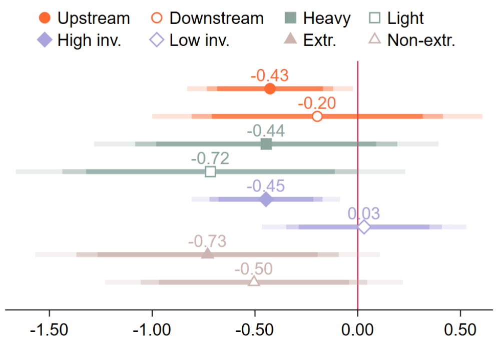
A. Population (1982)



B. GDP per capita (1982)



C. Population (2010)



D. GDP per capita (2010)

Note: This Figure displays the treatment estimates for the baseline county outcomes. The unit of observation is a county. All specifications include the extended controls of Table 4. In each panel, we report four set of estimates, obtained using treated and control counties associated with: a MRP operating upstream/downstream [*Upstream MRP/Downstream MRP*]; a heavy/light-industry MRP [*Heavy/Light*]; a high/low-investment MRP [*High-inv./Low-inv.*]; and an extractive/non-extractive MRP [*Extr./Non-extr.*].

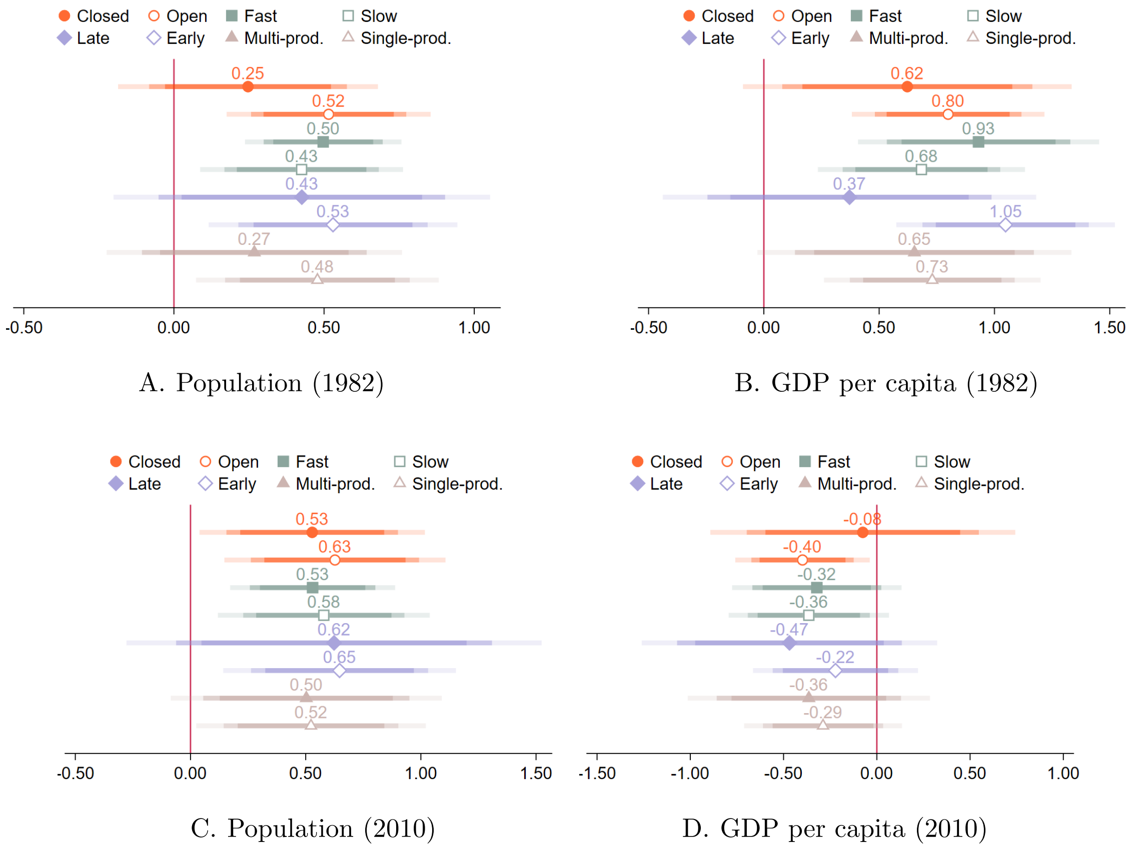
outcomes. Interestingly, counties receiving modest investments experience a smaller rise, but also a much smaller fall (Figure D7, panel D). The same can be said in counties where local MRP(s) were closed.

D.5 Product concentration at the county level

In this section, we study the relationship between treatment and product concentration at the county level. This exercise explores various aspects of the tangle of economic interactions between establishments and shows the dynamics of product concentration in treated counties.

Figure D9 provides a sensitivity analysis for Figure 6. In the baseline analysis, we rely on standard Herfindahl indices and Herfindahl indices with input/output weights better accounting for the proximity of products through production chains.

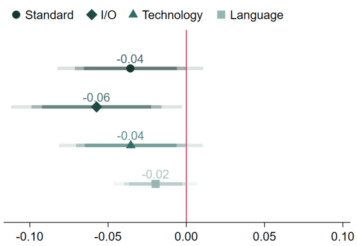
Figure D8. Treatment heterogeneity across MRP types—county results with other MRP types.



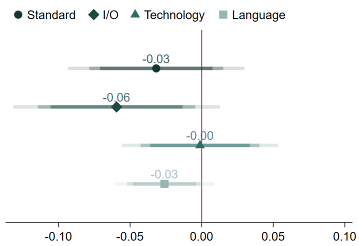
Notes: This Figure displays the treatment estimates for the following outcomes: *Labor cost* is the logarithm of total compensation per employee; *TFP* is the logarithm of firm-specific total factor productivity as computed in Imbert et al. (2022); *Patents* is the number of patent applications registered by the firm; *Markup* is a dummy equal to one if the markup is above-median within a 4-digit industry × year cell, computed following De Loecker and Warzynski (2012)—see Appendix B; *Production links* is a dummy equal to one if the firm operates along the production chain of local MRP(s); *Technological links* is a dummy equal to one if sectors in which the establishment and the MRP(s) operate are linked through patent applications. The unit of observation is a firm × year, we exclude the MRPs from the sample, and standard errors are clustered at the level of 2-degree × 2-degree cells. In each panel, we report four set of estimates corresponding to the following subsamples of establishments: (i) whether the MRP is still operating at the same location [*Closed*/*Open*], (ii) whether the time spent to construct the MRP(s) is above/below median [*Fast*/*Slow*], (iii) whether the time at which the construction of MRP(s) finished is above/below median [*Late*/*Early*], and (iv) the variety of products offered by the local MRP(s) [*Multi prod.*/*Single prod.*].

These Herfindahl indices are weighted by output, i.e., each firm enters their calculation with a weight equal to its output. In Figure D9, we use alternative weights (uniform across firms in panels A/D, employment-weighted in panels B/E, and output-weighted in panels C/F) and different linkages matrices. In particular, we use matrices based on technological linkages or product similarity as proxied by language similarity. We find that treated counties are less concentrated in production than control counties, irrespective of the exact specification for Herfindahl indices but for one exception, i.e., when linkages are calculated using the sparse matrix of technological linkages.

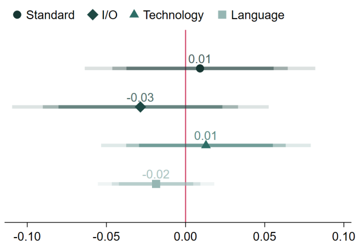
Figure D9. Production clusters in treated/control counties—robustness checks with alternative weights and indices.



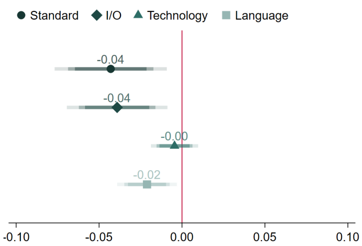
A. No weights



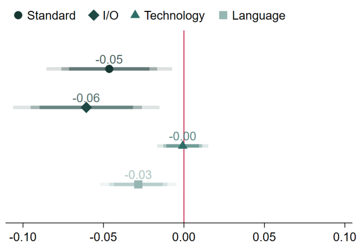
B. Employment weights



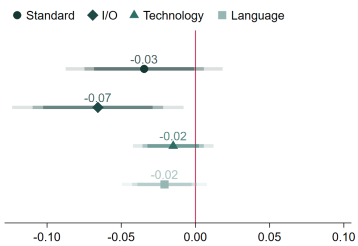
C. Output weights



D. No weights (95%)



E. Employment weights (95%)



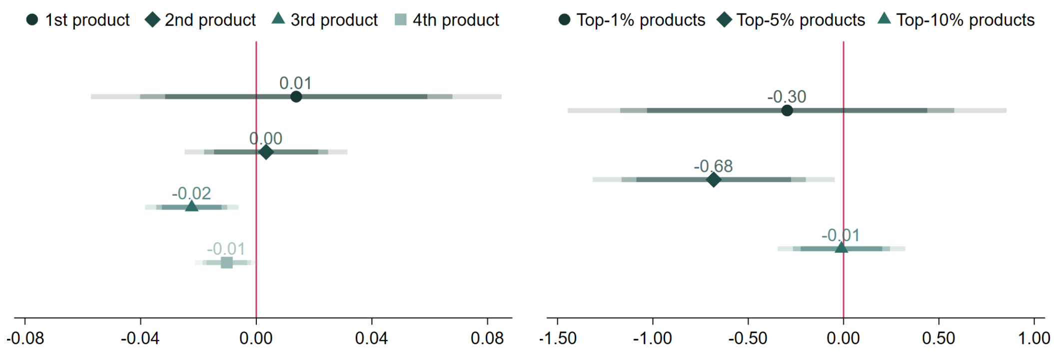
F. Output weights (95%)

Note: This Figure displays the treatment estimates for different Herfindahl indices. In panels A/D, these indices are created without weights, i.e., each production establishment is weighted uniformly. In panels B/E, these indices are created with employment weights; and in panels C/F, these indices are created with output weights—as in Figure 6. The top panels use the full sample, while the bottom panels drop the top-5% county/product-code shares. Within each panel, we report four estimates using the following matrices: **I** as in the standard Herfindahl index, a matrix based on input/output linkages (I/O), a matrix based on technological linkages, and a matrix based on product similarity as proxied by language similarity. In each specification, the unit of observation is a county, standard errors are clustered at the level of 2-degree $\times$ 2-degree cells, and we include the extended controls of Table 4. See Section 5.1 and Appendix B.1 for the construction of these indices.

Figure D10 provides further support for the observation that treated counties are less concentrated in production than control counties in spite of the presence of MRPs. More specifically, we compare across counties: (i) the output shares of the top-4 products (panel A); and (ii) the number of products whose output-weighted share is in the top 1, 5, and 10% across county/product code observations. We find that the largest product has a higher share in treated counties, but the subsequent clusters are significantly smaller. Along the same lines, the number of top (but not too large) product codes is smaller in treated counties.

The evidence shown in Figures 6, D9 and D10 is cross-sectional and discusses product concentration across counties without discussing its dynamics. We now shed additional light on the role of product concentration in explaining the fall of treated counties. To do so, we report our baseline treatment effect (see Equation 1), which we estimate separately on two measures of county-level product concentration in 1999, 2001, 2003, 2005, and 2007. As shown in Figure D11, production-based

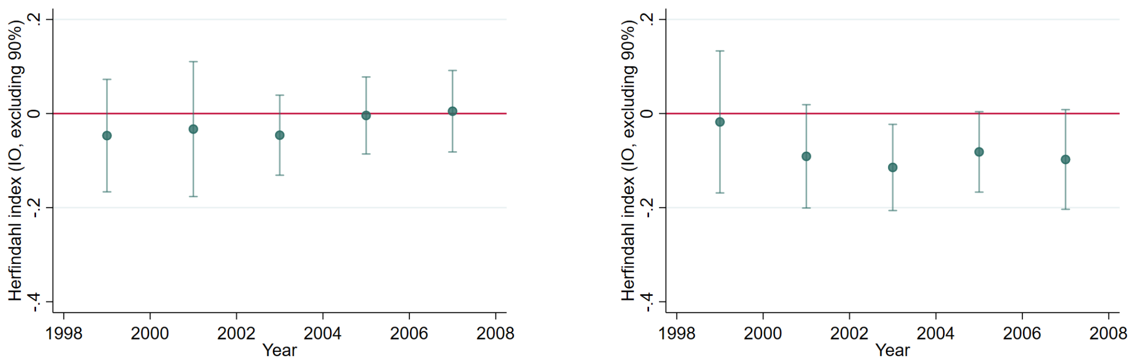
Figure D10. Production clusters in treated/control counties—top products.



A. Top products B. Number of top products

Note: This Figure displays the treatment estimates for (i) the output share of the top-4 products (panel A) and (ii) the number of products whose output-weighted share is in the top-1, 5, and 10% across county/product code observations. In each specification, the unit of observation is a county, standard errors are clustered at the level of 2-degree $\times$ 2-degree cells, and we include the extended controls of Table 4. See Section 5.1 and Appendix B.1 for the construction of these indices.

Figure D11. Dynamics of product concentration in treated and control counties.



A. Herfindahl index (I/O, all) B. Herfindahl index (IO, excluding 90%)

Notes: These Figures represent the treatment effect for product concentration (1999, 2001, 2003, 2005, 2007) for two different measures of concentration: the I/O Herfindahl index, obtained on the full sample of product codes and a Herfindahl index excluding the top-10% product codes.

concentration is stable in treated counties. This is, however, when considering all products within a county, including the dynamic effect of MRPs themselves. When we restrict the sample to top-10% product codes, we see a decrease in product concentration in treated counties, which coincides with the large, aggregate boom in manufacturing. In short, treated counties fail to see new, large industrial clusters appear relative to control counties.

D.6 Entrepreneurial values

The presence of large factories may discourage the *production* of entrepreneurs, or entrepreneurial spirit.[53] We investigate this possible effect using the China Family Panel Studies (CFPS) survey and its module on values and aspirations. The CFPS survey is a nationally representative survey of about 15,000 households carried out by the Institute of Social Science Survey at Peking University.[54] CFPS contains modules on aspirations and world outlook, in particular on effort and individualism, along with socioeconomic data. These modules provide us with rare information on entrepreneurial spirit.

Table D11. Values and aspirations in treated and control counties.

	Master's degree	No schooling necessary	Highly esteemed position
Panel A: Aspirations			
Treatment	0.075	-0.010	0.123
	(0.021)	(0.005)	(0.037)
Observations	1,838	1,838	1,838
	Hard work is rewarded	Inequality is necessary	Talent is important for success
Panel B: Values			
Treatment	-0.103	-0.376	-0.546
	(0.061)	(0.138)	(0.241)
Observations	420	420	1,838

Notes: Standard errors are clustered at the level of 2-degree × 2-degree cells. The unit of observation is an individual. All specifications include the extended controls of Table 4, and individual and household controls: respondent's age and gender, and household mean income and education (shares of household members at each level of education). The dependent variables are dummy-coded, except "Talent is important for success," which is expressed on a 0–10 scale. Some outcomes are only available for subsamples.

Table D11 presents the estimates of specification (1), at the individual level and controlling for respondent and household characteristics.[55] In Panel A of Table D11,

[53] A lack of entrepreneurial spirit may result from a composition effect—large industrial investments attract factory workers and lead to an emigration of entrepreneurs, as shown before. This mechanism was hypothesized by Chinitz (1961) to explain the demise of the Rust Belt.

[54] CFPS is representative of 95% of the Chinese population—Inner Mongolia, Hainan, Ningxia, Qinghai, Tibet, and Xinjiang are not covered. CFPS consists of five waves: a baseline in 2010, and four follow-up surveys in 2012, 2014, 2016, and 2018; we focus on 2012 and 2014, when our modules of interest are included. Please refer to www.isss.edu.cn/cfps for further information about CFPS.

[55] We control for the age of the respondent in 2014, the gender, and for the household level of education, income, and urban status. Note that only a subset of the CFPS households live in our sample counties, reducing the sample to 420 individuals for the values module and 1,838 in the

we analyze aspirations, focusing on education and job prestige. The population in treated counties is significantly more likely to aspire to tertiary education: treated respondents are 8 percentage points more likely to aspire to a master's degree (for themselves or for their children), compared to an average response of 6% in the control group. Respondents in control counties are also more likely to report that no schooling is necessary, but the effect is small (column 2). In column 3, we show that job prestige is significantly more likely to be emphasized in households living near a MRP.

We investigate the treatment effect on values in Panel B of Table D11. We use the following survey questions from CFPS: "Do you agree that the most important factor that determines one's success is how hard she works?"; "Do you agree that for the economy to thrive, one needs to enlarge income inequality in the population?", "How important is talent to a child's future achievement?" We find that individuals in treated counties are less likely to think that hard work will be rewarded, that inequality is necessary, and that talent is important for success. These results are consistent with lower individualism and a decline in entrepreneurship. They may either reflect (i) a composition effect, as the presence of MRPs leads to a selected emigration of entrepreneurs and managers (Section 5.3), or (ii) a direct treatment effect on the local culture of individuals.

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aspirations module—across 30 counties. The aspiration module applies to households with children aged 0–15, and answers are collected from parents. The values module applies to children aged 12–15.

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