

# Does Access to Better Schools Affect Private Expenditure on Children? Evidence from China

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## Abstract

This paper studies how parental investment in children responds to changes in public education provision. Based on transactions of China UnionPay debit and credit cards, we identify two types of child-related expenditure: extra-curriculum training and other child support. We exploit a quasi-experimental shock on education provision - a merger between two districts (Jing'an and Zhabei) in Shanghai. The merger allows Zhabei students to apply for high schools in Jing'an where more top-tier high schools are located. Using a Difference-in-Differences estimation, we find that relative to a third control district, cardholders in Zhabei spent more on children after the merger. The effect is stronger for cardholders who have children of pre-high-school age and for those who live closer to the old border but disappears for those who have adult children. Lastly, we rule out alternative channels via increased competition and housing appreciation. Overall, our findings suggest that parents spend more on children once educational opportunities improve; thus, equal allocation of public educational resources could encourage private parental investment in children.

**Keywords:** parental investment, child-related expenditure, public education, district merger

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## 1. Introduction

Parental investment constitutes an indispensable part of child human capital development. The literature provides extensive evidence that parental investment with varying forms is vital for shaping children's long-term outcomes in health, cognitive and non-cognitive skills, education attainment, and income (Carneiro and Heckman, 2003; Driessen, Smit, and Slegers, 2005; Cunha, Heckman, Lochner, and Masterov, 2006; Sacerdote, 2007). It is therefore of paramount importance to understand the incentives of parental investment in children. Besides household efforts, the other input of child human capital production is the provision of public education. While the existing literature mainly focuses on the direct impact of public education on children, the indirect impact that is mediated through parental investment is largely underexplored. In this paper, we study how parental investment in children responds to changes in the provision of public education.

It is theoretically unclear whether the provision of public education promotes or crowds out private parental investment in children. If the effect of public investment in child outcome is additive to that of parental investment (Becker, 1981; Becker and Tomes, 1976 and 1986), then the two are substitutes. Whereas if the effect of public investment in child outcome is multiplicative to that of parental investment (Goldberger, 1989), then the two are complements. In other words, how the rate of return of parental investment changes with the provision of public education could either amplify or reduce parental investment in children. Because public education to aid the young may either further stimulate private parental investment or not significantly better them if it offsets parental investment, understanding this question is of normative significance, especially given the fact that governments worldwide face budget constraints that limit the size and distribution of educational resources (Fryer and Katz, 2013).

Despite the theoretical importance and policy relevance, the debate on the interplay of these two types of input of child development is still ongoing, as empirical work remains limited, if any, and inconclusive. Empirical research in this literature presents two major challenges. First, parental investment in children varies in forms and is hard to observe. Current research mainly focuses on time investment in children that often involves parental behaviors at home and in schools to support their children's educational progress and social competence. For example, Pop-Eleches and Urquiola (2011), using Romania data, find that students who attend higher-achievement schools receive less homework-related help from their parents. In contrast,

Gelber and Isen (2013) show that the Head Start program in the US causes a substantial increase in parents' involvement with their children. Unfortunately, one of the most important forms of parental investment, monetary spending on children, is largely overlooked in the extant literature due to the difficulty of observing micro-level categories of household expenditure.<sup>2</sup>

To identify parental monetary investment in children, we utilize credit and debit card transactions of China UnionPay to trace child-related expenditure. As UnionPay is the only interbank payment network in China that intermediates all card-based expenditures, all spending on children via bankcards enters into our data. Specifically, based on transaction information on merchant categories, we divide child-related expenditure into two categories, extra-curriculum (EC) spending and other child support (OCS). EC includes payment to private institutions that provide extra-curriculum training for children, and OCS includes expenditure on child clothing, toys, zoo visiting, and etc.. We believe that EC captures the parental investment in children's tangible skills that directly contribute to their school outcomes, whereas OCS captures parental investment in children's intangible skills that are more likely to be associated with children's social and emotional competence, such as curiosity, self-confidence, and communication skills.

The second empirical challenge lies in the potential selection issue. For example, parents who value education highly are likely to both spend more on children and live in places with better public educational resources. To facilitate a causal interpretation, we exploit an exogenous shock to students' access to public education: a merger between two districts of Jing'an (JA) and Zhabei (ZB) in Shanghai. It has several appealing features that make it a suitable setting for answering our research question. First, before the merger, JA was endowed with significantly better educational resources than ZB, and the school zoning policy in China constrained students to apply for high schools in their own district. The merger lifted the barriers so that ZB students can apply for high schools in JA, and vice versa. In other words, the merger bestowed improved opportunities upon ZB students to access better high schools in JA. Second, school district mergers in a global context often suffer from the endogeneity problem, because merger decisions are usually made by voters in these affected districts (Coate and Knight, 2007; Gordon and Knight, 2008). The district merger in Shanghai, however, was a centralized political decision

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<sup>2</sup>Based on data from Zambia and India, Das et al. (2011) find that household spending substantially offsets variations in predictable school grants, but unpredictable grants have no impact on household spending.

intended to increase the land supply of JA district rather than to improve the educational resources in ZB.

We construct a panel dataset that consists of monthly expenditure of 1,300,690 bankcards for 12 months, 6 months before and 6 months after the merger. The average total expenditure per card per month is 1,897 RMB. The average EC expenditure on children is 10 RMB and OCS is 2 RMB. Child expenditure in the full sample is low because childless cardholders are also included. Thus, we create a subsample by including only cardholders who are identified as having pre-high-school children. In this subsample, child expenditure is on average 468 RMB per card per month, which accounts for 24% of the total expenditure. We find that parents tilt heavily toward training children's tangible skills: EC spending accounts for 22% of the total expenditure, whereas OCS accounts for only 2%.

This paper employs a Difference-in-differences (DiD) strategy by including a third district Huangpu (HP) as the control group. As another inner ring district in Shanghai, HP is bordered with both JA and ZB and is not affected by the merger. Our baseline estimation compares the logarithm of monthly child expenditure of ZB cardholders to that of HP cardholders before and after the merger to understand whether improved access to public schools affects parental investment. We find that cardholders in ZB spent 2.6% more on EC and OCS after the merger relative to those in HP. EC went up by 0.5%, and OCS by 2.1%. Different from child expenditure, total spending in ZB did not change significantly relative to those in HP, implying that ZB cardholders had to cut down other spending to increase their expenditure on children. The fact that we do not detect any significant increase in total expenditure also suggests that the merger's effect is confined to parental investment incentives on children only.

While the underlying assumptions of DiD estimation are not directly testable, we examine whether cardholders in the two districts exhibit any parallel trends in expenditure before the merger. First, we do not detect any persistently different trends in total expenditure, EC, or OCS before the merger. Second, we find that the increase in child expenditure is immediate and long-lived.

Because only cardholders who have children of pre-high-school age are directly affected, the baseline specification only captures the intent-to-treat (ITT) estimates. To better gauge the treatment effect, we perform the same DiD analysis within the subsample of cardholders that are identified with children of pre-high-school age. The results are consistent with what we find in

the full sample that ZB cardholders with young children spent 15% more in EC and 14% more in OCS than HP cardholders with young children but no difference in total expenditure. We then confirm that the magnitude of the merger's effect is indeed significantly larger for cardholders with young children by running a cross-sectional analysis using the full sample.

Next, we explore whether a second dimension of heterogeneity, i.e., distance to the old border, could moderate the merger's effects on child expenditure. Residential location affects the treatment intensity since daily commuting time is an important concern for school choices. Naturally, cardholders in ZB who live closer to the old border should have a greater incentive to send their children to attend good schools that are located in the old JA than those who live farther away.<sup>3</sup> We identify cardholders who are likely to live within 2 km of two underground stations in ZB, one closest to and the other farthest from the border. We find that cardholders who live farthest away from the border indeed spent less on children compared to those who live closest to the border after the merger. In this analysis, we also do not find any significant differences in total expenditure.

We examine whether a third dimension of heterogeneity, i.e., personal income, could moderate the merger's effects on child expenditure. Personal income is measured by the average monthly total expenditure via each bankcard prior to the merger. We show that more prosperous cardholders spent more on OCS than the poorer ones after the merger; however, we do not find a similar wealth effect on EC spending. This finding implies that parental investment in children's intangible skills could be more elastic than parental investment in tangible skills and is less likely to vary significantly across social classes.

Taken together, we find that improved access to public education in ZB encourages parental investment in children, suggesting that parents perceived an increase in return on private investment after the merger. Because the merger could have intensified competition among students, previous findings, however, could also be driven by stronger competition brought by the merger. We conduct several tests to examine the competition channel. First, we show that the merger likely introduced more intensified competition for JA students rather than ZB students. As mentioned, ZB had fewer top-tier high schools per capita than JA before the merger, consequently, the average admission score was higher in ZB than in JA, suggesting a stronger competition to get into top-tier schools in ZB. However, the gap in average admission score

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<sup>3</sup> In JA, all the top-tier high schools are non-boarding.

narrowed between JA and ZB after the merger, implying that the competition in ZB became easier. Consistently, the direction of student flows after the merger also verifies the finding from admission score: ZB had a significant larger fraction of students who went to the top-tier high schools in JA among all the ZB students who went to study in JA.

Second, if intensified competition is the primary channel that explains the entirety of our results for ZB cardholders, given that the merger should have introduced more competition to JA, we expect to see a similar, or even stronger, effect on the child expenditure of JA cardholders. To test this idea, we use the same DiD framework that compares the change in child expenditure of cardholders in JA to that of cardholders in HP. We find no significant change in EC, and significant but a very mild increase in OCS (only 30% of the magnitude for ZB cardholders) after the merger. We also compare the change in child expenditure of JA cardholders to that of ZB cardholders. Consistently, ZB cardholders show a higher increase in both EC and OCS after the merger. Taken together, the merger significantly improves parental investment in ZB; it also mildly stimulates parental investment in JA. However, the increase in ZB is more likely to be driven by improved educational opportunities and the increase in JA by more competition brought by the merger.

A second alternative channel is that the merger could potentially lead to housing appreciation, therefore generating a positive wealth shock for ZB residents. If potential gains in housing wealth could explain the increase in child spending after the merger, we should also expect to see an overall positive impact on total expenditure. After all, there is no particular reason for a newly wealthier household to cut other spending and exclusively increase expenditure on children. The fact that we do not detect any significant changes in total expenditure in our previous analysis lends support to the interpretation that the merger affects child expenditure through improved educational opportunities rather than a wealth shock. In addition, we find that neither the price nor the transaction volume of residential apartments in ZB experienced any noticeable increases compared to the HP district after the merger. Finally, we identify cardholders who own apartments in their own districts. We find that after the merger, their expenditure on EC and OCS did not change significantly compared to those who do not own apartments.

Finally, we conduct several robustness checks to verify our results. First, to further isolate the effect of the merger on parental investment, we run a placebo test on cardholders whom we

identify as parents with adult children (those who made payments to vocational schools after junior high school or universities before the merger). We find that cardholders with adult children in ZB and HP show no significant difference in either category of child expenditure, which suggests that the effect of the merger is likely to be specific to cardholders who have children of pre-high-school age. Furthermore, we also discuss the issue of one person owning multiple cards. We estimate that there are a 2.6% increase and a 28.5% increase in total child spending in the full sample and in the young children subsample, respectively, as a response to the merger. However, it is difficult to interpret these economic magnitudes at the individual level because one person could own multiple cards. To address to this issue, we repeat the analysis using a sample that includes debit cards only. Underlying this exercise is the common notion that people have greater incentives to own multiple credit cards for earning bonus points and repaying overdraft of other credit cards. For the debit card subsample, we still find significant increases in child expenditure of 1.11% and 40.08% in the full sample and in the young children subsample, respectively.

This paper contributes to the theoretical literature that studies the effect of public education on parental investment in children. If public and private parental investments are substitutes (Becker, 1981; Becker and Tomes, 1976 and 1986), then public education and other programs to aid the young may not significantly better them. If the two are complements (Goldberger, 1989), then public education to aid the young may further better them through boosting parental investment. Based on the setting of a district merger in China that promotes equal access to better public schools, we find evidence that supports the complementarity effect.

Our paper also fills the gap in the empirical literature on the interplay between public education and child education. To the best of our knowledge, this paper presents the first empirical evidence on parental pecuniary investment in children. Previously literature mainly focuses on parental time involvement with children in response to a change in the provision of public education and reaches mixed conclusions (Pop-Eleches and Urquiola, 2011; Gelber and Isen, 2013). We show that monetary investment made by parents responds positively to the provision of higher-quality public education.

More broadly, our paper speaks to the literature that studies the optimal size of a school district. School district consolidation is prevalently observed in the global context. For instance, the number of school districts in the United States has shrunk from about 117,000 to about

15,000 today. Extensive studies focus on the analysis of the same trade-off arising from a school district merger - reaching economies of scale versus retaining local control over school quality, and yield mixed findings on its real impact on students' long-term outcomes (Andrews, Duncombe, and Yinger, 2002; Heinesen, 2002; Gordon and Knight, 2008). The literature, however, fails to incorporate into its analysis the potential effect on private parental investment, which is equally important for child human capital development. Our result that equalizing education resources stimulates private parental investment in children who were initially disadvantaged alludes to implications of education resource consolidation above and beyond the commonly analyzed trade-off.

Finally, our paper sheds light on public education policies. A large body of literature analyzes the effect of some important aid programs to improve public education provision, such as Moving to Opportunities and the Head Start in the US. These programs usually require significant fiscal spending, and their intended effects on child outcomes remain inconclusive (Currie and Thomas, 1995; U.S. Department of Health and Human Services, 2010; Gelber and Isen, 2013; Chetty, Hendren, and Katz, 2016). On the contrary, less attention has been paid to public policies that aim to equalize educational opportunities across regions. There are two noticeable features about our setting: the merger is characterized by effectively a *redistribution* policy that equalizes the educational resources across two districts; thus, it does *not* require additional fiscal subsidies. We observe increases in child expenditure in both districts, although more moderate in JA, after the merger. We interpret the increase in ZB as a result mainly driven by improved educational opportunities and the increase in JA by more competition. As the fiscal constraint on public education has always been a challenge worldwide that inhibits education development, our study provides potentially a practical and cost-effective solution to alleviate such constraint. By building a more egalitarian and meritocratic education system, governments may harvest the benefit of stimulating private investment in children, which in turn could supplement the inadequacy in public investment.

Our paper proceeds as follows. Section 2 details the context of the districts merger in Shanghai in 2015. Section 3 describes our data. Section 4 explains our econometric framework and results. We provide several robustness tests in Section 5 and discuss alternative mechanisms in Section 6. Section 7 concludes.



## 2. Institutional Background

This paper exploits a quasi-experimental shock to students' access to public education – the district merger in Shanghai – to examine how parents respond to changes in public education provision. On September 7, 2015, Shanghai Municipal Government suddenly announced that districts Jing'an (JA) and Zhabei (ZB) would be merged into a new district bearing the former's name, effective from Nov 2015. The old JA district used to be the smallest district in Shanghai with a rich cultural heritage and concentrated high-end shopping centers. It was generally regarded as one of the most affluent districts in the city.<sup>4</sup> On the contrary, also located inside the inner ring, ZB district had a humbler economy yet a larger area. A map of the inner ring districts in Shanghai is presented in Appendix Figure 1. In 2015, the old JA had a resident population of 248.6 thousand, a land area of 7.62 km<sup>2</sup> and a GDP of 73.2 RMB billion, compared to a resident population of 848.5 thousand, a land area of 29.26 km<sup>2</sup> and a GDP of 74.8 RMB billion in ZB.

Unlike school districts mergers studied in the literature that are usually an endogenous decision made by multiple partners (Gordon & Knight, 2008; Coate & Knight 2007),<sup>5</sup> this merger in Shanghai was a purely centralized political decision seeking for potential economic synergies. The government officially claimed that the merger was to “improve the city's layout, making administrative divisions better suited for the city's development, lift the urban function, and promote sustainable regional development.” The general interpretation and conjecture of the official statement were that this merger was intended to increase the land supply of JA district and to upgrade the use of land in ZB district in the hope of increasing revenues source for local governments.<sup>6</sup>

Before the merger, most of the local public services, such as hospitals, were not exclusive to local residents, but with one exception, i.e., the access to public high schools.<sup>7</sup> Public high school admission in Shanghai is based on students' performance in a city-level standard entrance examination, but the selection is limited within each district. We offer an illustration of the

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<sup>4</sup> Shanghai is divided into 16 districts, 7 of which are considered as downtown districts (located within inner ring).

<sup>5</sup> Studies working on US context show that mergers must be approved by voters in both districts.

<sup>6</sup> Under the Chinese fiscal system, one of the most important revenue resources for municipal government is the revenue from land sales. For Shanghai city, about 30 % of its revenues from land sale in 2015. Market price for urban land is governed by a rating system with 10 ranks, and land with higher rank is associated with higher price. Land in the old JA district has higher ranks than the ones in ZB, and a district merger could upgrade old ZB land, therefore generate higher revenue for local government.

<sup>7</sup> The school zone of public primary and junior high schools is divided based on a smaller unit, e.g. postcode level, therefore the district merger did not affect the access to public primary and junior high schools.

system of public school entrance in Shanghai in Appendix Figure 2. In other words, students can only apply for high schools within their own district. The merger between JA and ZB lifted the admission barrier and allowed students to apply for high schools across the two districts; thus, both students and schools have a larger pool to apply for and select from.

Before the merger, the old JA district was endowed with more top-tier public high schools exclusively to its own residents.<sup>8</sup> According to Figure 1, before the merger the old JA had 7 top-tier high schools, while the old ZB only had 8 but with a population three times the size of that of JA. Naturally, that top-tier school density (school per capita) in old ZB was less the half of the level in JA, suggesting that students in old ZB used to face much stronger competition to get into a top-tier high school. The fiercer competition among students in the old ZB before the merger is also reflected in Figure 2: the average admission score for top-tier high schools in ZB was also higher than that in JA before the merger.

[[Insert Figure 1 and 2 about here]]

Given the uneven distribution of high-quality educational resources across these two districts, the merger was generally perceived as a pronounced improvement in educational opportunities for ZB students. In theory, it may lead good students in ZB who would have had no chance to attend top-tier high schools in ZB, had there been no such merger, to apply for top-tier high schools in JA. We confirm this idea in Figure 2 and Figure 3. Figure 2 shows that admission scores for top-tier high schools in JA increased more than that in ZB, suggesting stronger positive selection in JA after the merger. Figure 3 reports the data on student flows between these two districts in the years 2016 and 2017. While 92.6% of old ZB students who studied in the old JA schools after the merger managed to enrol into the top-tier high schools, only 55.8% of old JA students who studied in the old ZB schools enrolled into the top-tier high schools in ZB. Two figures combined suggest that students from ZB are likely to benefit more from the merger.

[[Insert Figure 3 about here]]

### 3. Data

The unique dataset this paper utilizes is the universe of credit and debit card transaction data provided by China UnionPay. Founded in 2002, China UnionPay is an association for China's

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<sup>8</sup> China has a two-tier public schools system that top-tier schools (重点中学) explicitly received much better resource and support than normal schools (普通中学), therefore much better academic performances.

banking card industry, operating under the approval of the People's Bank of China (the central bank of China). UnionPay is the only interbank payment network in China and intermediates all card-based expenditures. It is the largest network in the world in terms of both the number and value of transactions, ahead of Visa and Mastercard. It is an electronic funds transfer at Point-of-Sale (POS) network and the only interbank network in China that links all the Automatic Teller Machines (ATMs) of all banks throughout the country.

We utilize all bankcard transactions in the three districts of Shanghai, namely, Zhabei, Jing'an and Huangpu, to identify total expenditure and specific expenditure on children per card. Any transactions on child-related items made via bankcards will enter our data. . Our data includes transactions of 1,300,690 cards over 274 merchant categories between April 2015 and March 2016. Each observation records the location, time, value, and the merchant category of the transaction. We aggregate the data to card-month level. Given that bankcard transactions have a high penetration in the retail spending in China, our data represents a sizeable proportion of household real spending activities. According to official statistics from the Central Bank of China (2015), bankcard transactions accounted for 48% of overall spending in retail sales of consumer goods in the third quarter of 2015, and we believe that the ratio should be even higher in Shanghai, as it is the most commercialized metropolitan in China

We examine two types of expenditure on children, namely, extra-curriculum (EC) spending and other child support (OCS). Specifically, EC includes payment to private institutions that provide extra-curriculum training (e.g., Shao Nian Gong) and stationary. OCS includes expenditure on children clothing, toys, zoos, and etc. EC captures parental investment in child tangible skills that could directly enhance student's academic performance, while OCS spending may help develop child intangible skills that is largely believed to be associated with social competence such as curiosity, self-confidence, and etc. (Chen and French, 2008). Because the school zone of public primary and junior high schools is divided based on a smaller unit than district, the district merger should not affect the access to public primary and junior high schools. In addition, because China mandates nine-year compulsory education, parental expenditure on formal education earlier than high schools does not reflect parent's own investment decisions. Thus, we do not include payment to formal education before high schools.

Transaction data features two important advantages over consumer expenditure surveys. First, card transactions reflect real-time purchases as opposed to respondents' self-reporting and

recollection of their spending. Second, they are of high frequency, which enables researchers to study immediate changes in spending. One limitation of our data is nevertheless the lack of demographic information on cardholders. To overcome this limitation, we develop algorithms with the research team at UnionPay to explore the knowledge graph of cardholders. In the context of this paper, our knowledge graph aims to uncover the residence location of each cardholder at the district level for the main analysis of the paper and within 2 kilometers of several underground stations for the cross-sectional analysis.

Specifically, we infer the residence location for each cardholder by employing a score-based algorithm that reads into the card's historical expenditure one year prior to the merger. Underlying our methodology is the assumption that where to consume (i.e., the merchant location) is correlated with residence location, but to a varying degree. For example, one is more likely to go to a laundry store that is near his or her living neighborhood, whereas which restaurant to dine is less indicative of a person's residence location. Thus, we assign a score ranging from 1 to 10 to different spending categories. A higher score is assigned to property management, utilities, laundry stores, kindergartens, primary and middle schools, and a lower score is assigned to ATMs, restaurants, supermarkets, convenient stores, and etc. Since each merchant has an address, we aggregate, for each card, the scores of all transactions by districts. Finally, the district that receives the highest score is viewed as the primary residence district of the cardholder. In total, we identify 334,024 cards with primary residence location in JA, 860,890 cards in ZB, and 105,776 cards in HP. We will discuss the algorithm that identifies the residence location of each cardholder within 2 kilometers of several underground stations in Section 4.4.

We summarize the key variables in Table 1 for the full sample and by residence districts. Average total expenditure per card per month is 1,897 RMB. Debit cards have a higher expenditure (2,706 RMB) than credit cards (1,262 RMB). Given that the annual income per capita in Shanghai was 47,710 RMB in 2015 and that the private saving ratio was around 50%<sup>9</sup>, our data is likely to capture a considerable proportion of actual spending. The average EC expenditure on children is 10 RMB, and OCS is 2 RMB. Because the full sample covers all cards including childless cardholders, child expenditure in the full sample is likely to underestimate the parental investment. Comparing across different districts, ZB and JA residents spend similar

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<sup>9</sup> More details at <http://www.shanghai.gov.cn/nw2/nw2314/nw24651/nw31071/nw31120/u21aw734365.html>.

amounts close to 2000 RMB per month, and HP residents spend a third more. This is also largely consistent with the notion that HP is the center of downtown Shanghai.

[[Insert Table 1 about here ]]

To have a more precise gauge of expenditure on children, we identify cardholders who have children before high-school age by examining their historical spending. We identify cards that made expenditures on EC, OSC, formal schooling before high schools, and children's hospitals one year before the merger. We summarize the key variables for the subsample of cardholders who have young children in Table 2. While total expenditure for this subsample is of a similar magnitude compared to that of the full sample, and also by districts, the child expenditure is much higher in Table 2. Child expenditure is on average 468 RMB per card per month, which accounts for 24% of total expenditure. We also find that parental investment in child skills tilts heavily toward tangible skills. Average EC spending is 458 RMB, accounting for 22% of total expenditure, whereas average OCS spending is 10 RMB, accounting for only 2% of total expenditure.

[[Insert Table 2 about here ]]

## **4. Empirical Results**

In this section, we examine the difference in the expenditure of cardholders between JB and HP district (our control group, as noted in Section Data) before and after the merger using a Difference-in-differences strategy for the full sample (Section 4.1), a pre-trend analysis (Section 4.2), a subsample of cardholders with pre-high-school children (Section 4.3), heterogeneous results on distance to the older border (Section 4.4), and heterogeneous results regarding income level (Section 4.5).

### ***4.1. Baseline Analysis***

We conduct empirical analysis at the card-month level for one year that starts from March 2015 to February 2016, 6 months before and 6 months after the announcement of the merger. It covers universal cardholders whose residence location is either in ZB or HP (our control group, as noted in Section Data). By focusing on monthly expenditure in a one-year horizon, we can study the immediate effect of the merger and rule out other confounding changes that would take more time to materialize, for example, new schools or establishments built in these districts as a

deliberate response to the merger. We employ a Difference-in-Differences (DiD) estimation as in Equation (1).

$$C_{ijt} = \alpha + \beta ( Zhabei_{i,j} \times After_t ) + \gamma_i + w_t + \varepsilon_{ijt} \quad (1)$$

Where  $C_{ijt}$  refers to the logarithm of monthly expenditure for card  $i$  in district  $j$  in month  $t$ . It includes total child-related expenditure, extra-curriculum spending (EC), and other child support spending (OCS).

The dummy variable  $After_t$  equals 1 for months starting from September 2015.  $Zhabei_{i,j}$  is a dummy variable that equals 1 if a cardholder's residence location is in the old ZB district and 0 if in HP. In this specification, we control for all the time-invariant differences across cardholders (e.g., gender, education, and etc.) by including card fixed effects  $\gamma_i$ . We also include month fixed effects  $w_t$  to control for changes over time that affect both districts in the same way. All standard errors are clustered at the card level.

[[Insert Table 3 about here ]]

Table 3 presents the results. Columns (1)–(3) show that cardholders in ZB spend 2.6% more in children-related items compared to those in HP after the merger. It corresponds to an economic magnitude of 0.3 RMB more per month after the merger. Both extra-curriculum (EC) spending and other child support (OCS) spending increased. EC went up by 0.5%, and OCS by 2.1%. Although these effects are all statistically significant, the economic magnitude is somewhat limited. This is likely to be caused by the fact that not all cardholders have children. We will later discuss this issue in Section 4.3.

In contrast, columns (4)–(6) suggests that total monthly expenditure, either through credit cards or debit cards, does not vary much between ZB and HP after the merger. This finding implies that ZB cardholders had to cut down other spending to increase their expenditure on children. In unreported tests, we explore some categories of adult-exclusive expenditure that are likely to be cut down, namely, coffee, cigarette and alcohol, and beauty (including beauty salons and cosmetics). We find that only beauty expenditure declined for cardholders in ZB after the merger, suggesting that mothers probably cut down their beauty spending to subsidize their increased spending on children.

#### **4.2. Pre-trend Analysis**

While the underlying assumptions of DiD estimation are not directly testable, we provide a pre-trend analysis to examine if expenditure patterns differ between the two districts in months

leading up to the merger. We replace  $Zhabei_j \times After_t$  in Equation (1) with  $Zhabei_j \times w_t$ . Table 4 reports the results.

[[Insert Table 4 about here]]

In Panel A of Table 4, we use the full sample and take August 2015 as the reference month. Overall, we do not find a systematic difference in either child expenditure or total expenditure in months leading up to September 2015. For example, Column (3) in Panel A of Table 4 shows that there is no significant difference in OCS spending between these two districts before the merger. The effect of merger started to bite in September, precisely the month when the merger was announced. In addition, the impact on OCS persists in the next 6 months after the merger. Figure 4 further visualizes the findings on total child expenditure with a 95% confidence interval. As shown, the cardholders in ZB started to spend significantly more than those in HP just after the merger, and the spending gaps range from 1.67% to 3.49%.

[[Insert Figure 4 about here ]]

EC spending exhibits seasonality. Column (2) in Panel A of Table 4 shows that after the merger, the spike in EC occurs in September and January, which correspond to the beginning of an academic year and the winter holiday. Extra-curriculum training schools usually start new programs in these months and require tuition fees to be paid at the enrolment time.

In Panel B of Table 4, we extend the sample period and include only months in which EC spending is likely to be concentrated in order to better understand the dynamic effect of seasonality on EC. We include Jan 2015, June 2015, Sep 2015, Jan 2016, and June 2016; they correspond to the beginning of either a school break or an academic year. We conduct a similar pre-trend analysis as in Panel A and take Jan 2015 as the reference month. Overall, we do not find a persistent difference in EC spending in months prior to the merger. In addition, EC spending in Jan 2016, and June 2016 for cardholders in ZB increased significantly relative to those in HP after the merger.

### **4.3. Subsample with Young Children**

While the baseline analysis indicates a significant increase in child expenditure for ZB cardholders after the merger, the economic magnitude is limited. This is likely to be caused by the fact that not all cardholders have children. In other words, the baseline specification only captures the intent-to-treat (ITT) estimates by considering all cards in ZB as affected by the merger. In fact, the district merger should only directly impact cardholders who have

pre-high-school-age children. Our previous results, therefore, could be biased if the shares of cardholders who have pre-high-school children were different in ZB and HP.

As discussed in Section 3, we cannot observe cardholders' demographic information. To better gauge the effect of the merger on parental spending on children, we identify a group of cardholders who have children with pre-high-school age (hereinafter, young children) based on a bankcard's transaction history. Specifically, we identify cards that spend on tuition fees for primary schools or junior high schools, children's hospitals, EC or OSC, one year before the merger. We are fully aware that the algorithm to create the subsample of cardholders with young children may not be precise, however the statistical error is more likely to be type I (fail to include all cardholders with young children) than type II (to include childless cardholders in). We, therefore, first perform the same DiD analysis for this subsample of cardholders with young children in Table 5, and then offer a cross-sectional analysis using the full sample in Table 6.

[[Insert Table 5 about here]]

Table 5 presents the subsample DiD results. We find that the merger's effect is significant for total child expenditure categories, EC and OCS spending. Noticeably, ZB cardholders who are identified with young children spent 15% more in EC and 14% more in OCS than HP cardholders who are identified with young children. In total, child spending went up by 25.1%. This is in sharp contrast with the moderate increases in the full sample analysis (i.e., 0.5% in EC, 2% in OCS, and 2.5% in total spending). Measuring by RMB, total child spending went up of by 117 yuan per month in this subsample. Consistent with the results in the full sample, we do not find any significant changes in total expenditure.

$$C_{ijt} = \alpha + \beta ( Zhabei_{ij} \times After_t \times Kid_{ij} ) + Other \ interactions + \gamma_i + w_t + \varepsilon_{ijt} \quad (2)$$

To further test whether the magnitude of effect is significantly higher for cardholders with young children, we conduct a cross-sectional analysis using the full sample. We include a triple interaction between Zhabei×After×Kid as in Equation (2); it allows for additional variation along the dimension of whether a cardholder is regarded as having young children. We report the results in Table 6.

[[Insert Table 6 about here]]

First, we find that the effect of the merger is more pronounced for cardholders with young children than those without, with magnitudes of 25.1% more in total child spending, 13.6% more in EC, and 12.2% more in OCS. Second, the DiD coefficient of Zhabei×After stays significant



for total child expenditure and OCS after adding the triple interaction term, suggesting that our algorithm indeed fails to identify all the cardholders with children. Taken together, the results in this section lend further support to the baseline analysis by showing that the merger is likely to impact cardholders with young children the most.

#### **4.4. Heterogeneity: Distance to the Old Border**

One major concern for our previous subsample analysis is that we rely on historical child-related expenditure to detect whether a cardholder has a young child or not. Thus, the algorithm may select parents who care about children and are more willing to spend on children into our subsample, therefore overestimating the merger’s effect. In this section, we explore another dimension of heterogeneity which utilizes all categories of expenditure that are more likely to be independent of future child expenditure: distance to the old border between JA and ZB.

In JA, all the top-tier high schools are non-boarding. Thus, cardholders in ZB who live closer to the old border between JA and ZB should have a greater incentive to send their children to top-tier schools located in JA. Appendix Figure 3 shows that Underground Line One passes through ZB and JA. On this line, Hanzhong Road (汉中路) Station in ZB district is closest to JA, and Gongkang Road (共康路) Station in ZB is farthest from JA. There are six more underground stations between these two stops.

We infer the distance of ZB cardholders to the eight underground stations in ZB by employing a similar score-based algorithm as the one we use to identify a cardholder’s residential district the Data section. Underlying our methodology is the assumption that where to consume is correlated with residence location. We sift through each card’s historical spending one year prior to the merger. We, however, require more precise identification of the residence location this time - within 2 km of each underground station. To do that, we utilize the Global Positioning System (GPS) provided by Baidu Map for each merchant. We calculate the coordinate distance between each merchant to the nearest underground station out of the eight underground stations. We keep transactions at merchants that are within 2km radius of the nearest underground station. We then employ the same scoring system for the merchants as described in the Data section. We aggregate for each card the scores of all transactions by underground stations. Finally, the underground station that receives the highest score is viewed as the primary residence location of the cardholder.

$$C_{ijt} = \alpha + \beta \text{Far}_{ij} \times \text{After}_t + \gamma_i + w_t + \varepsilon_{ijt} \quad (3)$$

We perform a DiD analysis within ZB cardholders as in Equation (3). Specifically, we compare the change in child expenditure after the merger between cardholders who live close to Gongkang Road Station to those close to Hanzhong Road Station. We construct a dummy variable *Far*, which equals 1 if the cardholder lives near Gongkang Road Station, and 0 if near Hanzhong Road Station. Table 7 presents the results.

[[Insert Table 7 about here]]

Because all top-tier high schools in JA are non-boarding, daily commute is important for school choices. In other words, the merger’s effect tends to be stronger for cardholders living near Gongkang Road Station than cardholders near Hanzhong Road Station, since it is more costly and time consuming for parents and children to attend schools that require long commute time. For total child expenditure, we find that cardholders near Gongkong Road Station spent less on children compared to those near Hanzhong Road Station after the merger. The effect is most noticeable for OCS spending: cardholders near Gongkong Road Station spent 1.5% less on OCS compared to those near Hanzhong Road Station. Regarding EC spending, after including only the seasonality months (September, June and January, as suggested in Table 4), cardholders living far away from the old border spent 0.91% less on EC compare to those close to the border. In this analysis, we also do not find any significant increase in total expenditure.

#### **4.5. Heterogeneity: Personal Income**

We explore another dimension of heterogeneity - personal income - to exam whether the merger effect varies across different income groups. As noted earlier in Introduction, the extant literature provides mixed findings on the effect of public education provision on parental investment in children, specifically, time involvement. One possible explanation is that the effect may vary across families with different economic endowments. On the one hand, more prosperous families are more resourceful to invest in their children and therefore are more likely to exploit the improved educational opportunities brought by the merger. On the other hand, as wealthier families have more outside options other than public high school, such as private high schools, these families are less motivated to respond to the merger.

$$C_{ijt} = \alpha + \beta ( Zhabei_{ij} \times After_t \times Income_{ij} ) + Other\ interactions + \gamma_i + w_t + \varepsilon_{ijt} \quad (4)$$

Because we do not observe a cardholder’s actual income levels, we calculate the average monthly total spending for each card before the merger to indicate personal income. We believe that consumer spending is indicative of a cardholder’s actual income level. In Equation (4), we

include a triple interaction term  $Zhabei_j \times After \times Wealth_{ij}$  to capture the different treatment effect brought as a result of varying income levels. Table 8 reports the results.

[[Insert Table 8 about here]]

We find that wealthier cardholders spent more on OCS than more impoverished cardholders after the merger. A 1% increase in personal income is translated into a 0.12% increase in OCS spending. In contrast, we do not find any significant differences in EC spending between the rich and poor cardholders. Parents may perceive clothes and zoo visits as less necessary for their kids than skill training, as the former does not directly improve a child's performance. When the perceived opportunity in getting into good public schools improves, poorer parents prioritize their investment on tangible skills over intangible skills. This finding suggests that parental investment in child tangible skills is less elastic than investment in intangible skills.

This finding suggests that access to better educational resource could promote more investment in children's academic performance across all social classes; however, only wealthy families are also encouraged to invest more in child intangible skills, implying that other aspects in human capital, such as social skills and confidence, is more likely to subject to persistence in income inequality.

## 5. Robustness Tests

### 5.1. *Subsample of Debit Cards*

One limitation of this dataset is that we cannot match card ID to cardholder. As a result, we are not able to make inference for one individual based on the card-level analysis because it is possible that one person owns multiple cards.

[[Insert Table 9 about here]]

To see sensitivity of our results to the issue of multiple cards, we repeat the DiD analysis using a sample that includes debit cards only, and the results are presented in Table 9. We restrain our sample to debit cards because people are more likely to possess multiple credit cards than multiple debit cards, as credit cards are often used to earn bonus points and repay the overdraft of other credit cards. In Table 9, we find that total child spending increases by 1.11% for ZB debit-card holders after the merger, compared to 2.6% when all cards are included. The slightly smaller effect could be explained by the fact that childless cardholders are usually young

people who are less eligible to apply for credit cards. Then we zoom another subsample that covers only debit-card holders with young children to better gauge the effect of multiple cards. When focusing on the subsample of debit cardholders with young children, the effect jumps to 40.08%, compared to 28.5% when all cards are used. In short, the merger's impact on child expenditure is more pronounced if only looking at debit-card holders with young children.

Overall, our findings suggest that the merger also has a significant effect on the sample of debit cards, but inferring the magnitude at the individual level is sensitive to the issue of multiple cards.

### **5.2. *Placebo Test: Subsample with Adult Children***

To see whether the effect of the merger is specific to cardholders who have pre-high-school-age children, we run a placebo test by examining whether the merger also affects cardholders who are identified as having adult children (too old to go to high school) or too young to have school-age children.

To do so, we identify cards that paid tuition fees to tertiary education institutions, including universities, vocational schools and correspondence schools, one year before the merger. The assumption here is that the cardholders who paid for the tertiary educations are either the parents with children at post-secondary-school age or university/college students themselves. Neither of them would be affected by the high-school-district merger. We then perform the same DiD analysis within this subsample.

[[Insert Table 10 about here]]

Table 10 presents the results. Different from the findings in Table 5, the merger presented no different impact on ZB cardholders from HP cardholders. Neither EC nor OCS experienced increases after the merger. In short, the results in this section further confirm that the merger's effect is specific to cardholders who have young children.

## **6. Alternative Channels**

In section 5, we find that the merger between ZB and JA positively affects ZB cardholders' investment decisions in children, and more importantly, we argue that their improved entitlement to accessing better public schools drives this change. However, apart from access to public education, other factors may have altered contemporaneously with the merger and may have

influenced cardholders' expenditure on children too. In this section, we discuss two alternative mechanisms through which the merger may impact cardholders' expenditure decisions.

### **6.1. Housing Appreciation**

The first alternative channel takes effect through potential housing appreciation in the old ZB district. As discussed in Section 2, the old JA was regarded as one of the most affluent districts in Shanghai with a rich cultural heritage and concentrated shopping centers, consequently with high real estate prices. On the contrary, ZB had a much humbler economy and a larger area, consequently with lower housing prices. It is possible that bearing JA's name after the merger, housing prices in the old ZB could go up and converge to the price level in the old JA. In addition, as cardholders who have young children are also more likely to own residential properties, they may be the ones who benefit the most from the potential housing appreciation. In this section, we test whether housing appreciation is the primary driver that affects the changes in expenditure patterns for ZB cardholders.

First, we document both prices and transaction volumes of the residential properties in ZB and HP district in Figure 5. It is clear that neither the housing price nor the transaction volume in ZB experienced a significant surge within half a year relative to August 2015, after the merger. It means, contrary to what one may expect, housing market in ZB remained relatively stable after the merger. Thus, there was no actual positive wealth shock for the ZB house owners.

[[Insert Figure 5 about here]]

Second, although we do not find evidence of actual housing appreciation, residents in ZB may respond to the merger by adjusting their anticipation of real estate prices upward, which could also influence expenditure patterns. If this is the case, instead of observing an increase in only child expenditure, we should expect to see a rise in total expenditure for ZB cardholders after the merger. However, Column 4 of Table 3 and Column 4 of Table 5 both indicate that the merger did not bring significant changes in total expenditure. These findings lend further support to our interpretation that the merger affects child expenditure through improved educational opportunities but not anticipated wealth gains.

Third, we further identify cardholders who are property owners in their residing districts by examining payments made to local property services agencies and real estate agencies. If it is housing appreciation that primarily drives the previous results, then cardholders who are

property owners should respond more pronouncedly to the merger than non-property owners. We test this idea in Table 11.

[[Insert Table 11 about here]]

In Panel A of Table 11, we examine whether the merger's effect is stronger for house owners by including a triple interaction  $Zhabei \times After \times House$ . One challenge arises when interpreting the results in Panel A: parental status tends to be positively associated with property ownership. In other words, cardholders with children are also more likely to own residential properties. To isolate the effect of housing price appreciation from improved educational opportunities, we employ an interaction between  $Zhabei \times After \times Child \times House$  under the same DiD strategy in Panel B. *House* is a dummy variable that indicates whether a cardholder is a property owner in their residing district. We find that in the group that are identified with young children, the effects of the merger on EC and OCS do not differ significantly between cardholders with and without properties. Taken together, our findings further confirm that the merger is unlikely to affect ZB cardholders' expenditure decisions due to anticipated gains in the real estate market.

## **6.2. Stronger Competition**

Another alternative explanation is that parents anticipate fiercer competition after the merger and thus invest more in their children. As discussed previously, the admission decision for public high schools in Shanghai is made based on each student's performance in a standard examination. Indeed, by enlarging the candidate pool, the district merger may intensify the competition. We conduct several tests to examine the competition channel.

First, detailed study in Section 2 shows that the merger probably even weakened the competition for the students in the old ZB, whereas intensified the competition in the old JA. As shown in Figure 1, the old ZB had only half of the level of top-tier high schools per capita of JA. Thus, students in old ZB used to face much stronger competition to get into a good public high school. This is also reflected in Figure 2 that the average admission score of top-tier high schools was higher in ZB before the merger. Consistently, the gap in average admission score also narrowed after the merger. Figure 3 further shows that the merger allows a higher percentage of good students enrolling in top-tier high schools in the old JA.

Given that the merger tends to introduce more competition to JA rather than ZB, if the increase in child expenditure in ZB was driven by competition brought by the merger, we should

expect an even more noticeable effect for cardholders in JA. To test this, we compare the change in child expenditure of cardholders in JA to that of cardholders in HP by employing the same DiD strategy. We report the results in Table 12.

[[Insert Table 12 about here]]

We use all cards in columns (1)-(3) and a subsample of cards for which we identify having young children in columns (4)-(6). In contrast with the results in Table 3 and Table 5, we find that JA cardholders did not increase EC spending compared to HP cardholders after the merger. Second, we observe a significant but only a moderate increase in OCS spending for JA cardholders; and the magnitude of the effect is only 30% of the effect when comparing ZB to HP. In unreported tests, we compare the change in child expenditure of JA cardholders to that of ZB cardholders directly. The findings consistently show that ZB cardholders have a higher increase in child expenditure, in both EC and OCS.

In conclusion, we believe that the increase in parental investment in ZB is more likely to be driven by improved opportunities to better education, and the mild response in JA is possibly to be driven by stronger competition.

## **7. Conclusion**

This paper examines whether parental investment in children responds to changes in the provision of public education and presents, to our knowledge, the first evidence of parental pecuniary investment in children. We exploit an exogenous shock on public education provision brought by a district merger in Shanghai. The merger equalized and, more importantly, improved the chance of ZB students who were initially disadvantaged to get into good public high schools. We construct a unique transaction-level dataset of China UnionPay debit and credit cards across three districts in Shanghai.

Using a simple DiD framework, this paper shows that cardholders indeed increased their spending on children, in both extra-curriculum training and other child support, as a response to the improved educational opportunities. The effect is both immediate and persistent. In addition, we further explore the heterogeneity in cardholders' response to the merger and find that the effect is stronger for cardholders who have children of pre-high-school age and for those who live closer to the old border but disappears for those who have adult children. Lastly, we discuss potential alternative changes that may influence expenditure decisions, and rule out the

possibility that the previous results are driven by increased competition and housing appreciation due to the merger.

This paper fills gaps in the literature on the interplay between public education and child education and presents important policy implications. Many public education programs that have been widely studied in the literature usually require monetary subsidies on education provision. The district merger in Shanghai was a redistribution of educational resources based on a meritocratic exam across two districts; it thus does not require additional fiscal subsidies. Our findings suggest that without extra public spending, simply improving the perceived opportunity to get into good schools could stimulate private investment in children, thus supplementing the inadequacy in public investment.

This study also opens interesting questions for future research. For example, cultural values often influence education decisions; it is, therefore, unclear whether the pattern of investment in children that we uncover for Chinese parents is a feature that also exists in other societies. In addition, because this paper is silent on children's actual outcomes, more empirical research that can link child long-term outcomes to parental pecuniary investment in children will be vital to complete our understanding on the role of the interplay between public and parental investment in child human capital development.



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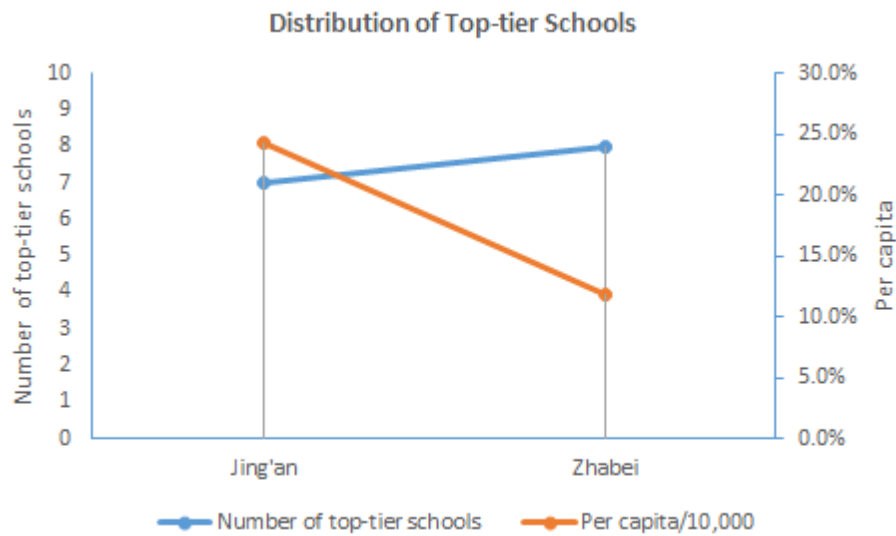
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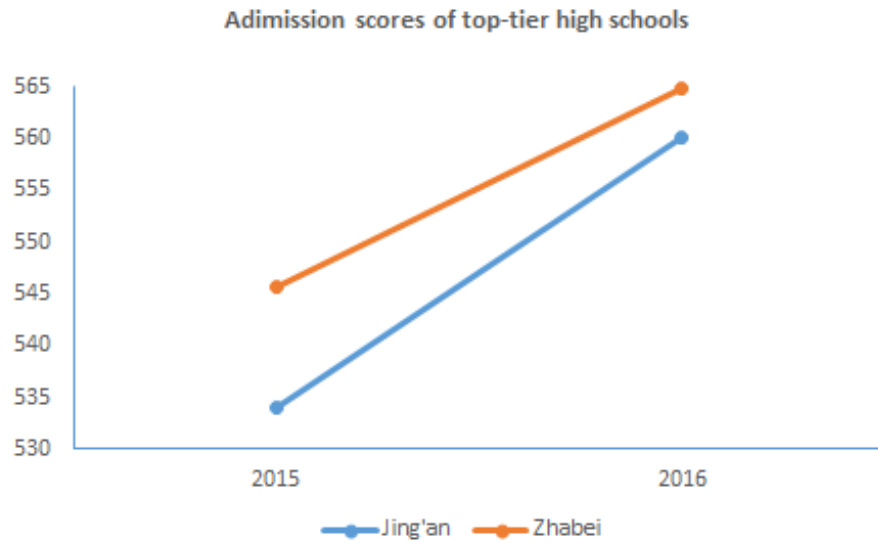
# Figures

Fig. 1. Supply of Top-tier High Schools in Zhabei *vs* Jing'an



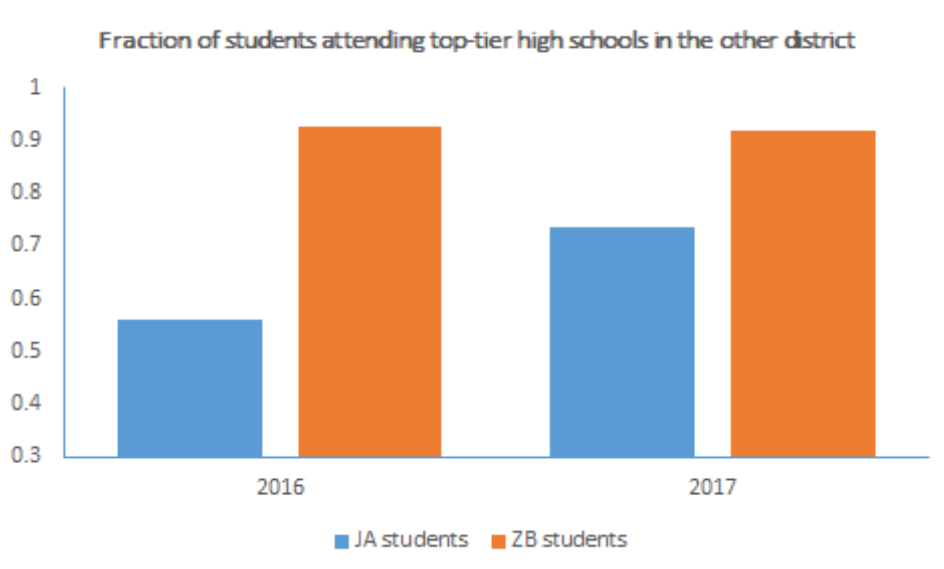
Notes: This figure presents the inequality in public school provision between Jing'an and Zhabei before the merger. The blue line displays the number of top-tier public high schools in each district (left y-axis), while the orange line reports the density of top-tier public high schools over district population in 10,000 (right y-axis).

Fig. 2. Admission Scores Before and After the Merger



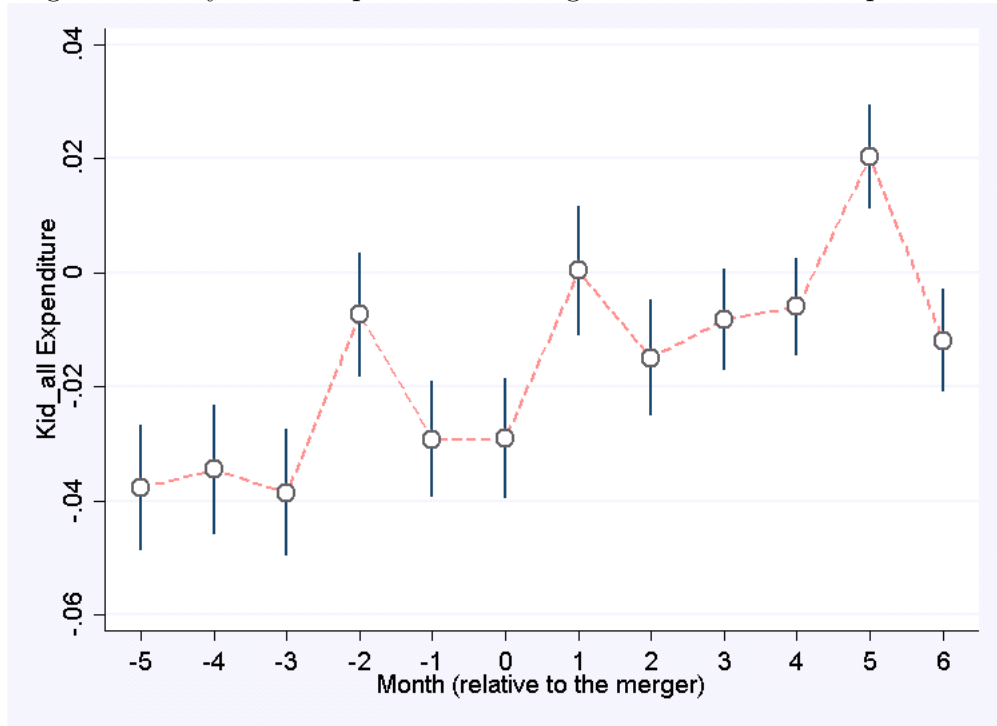
Notes: This figure displays the average admission scores of the standard entrance examination for top-tier high schools by districts in years 2015 and 2016. The orange line represents the average score in Zhabei district, and the blue line Jing'an district.

Fig. 3. Student Flows After the Merger



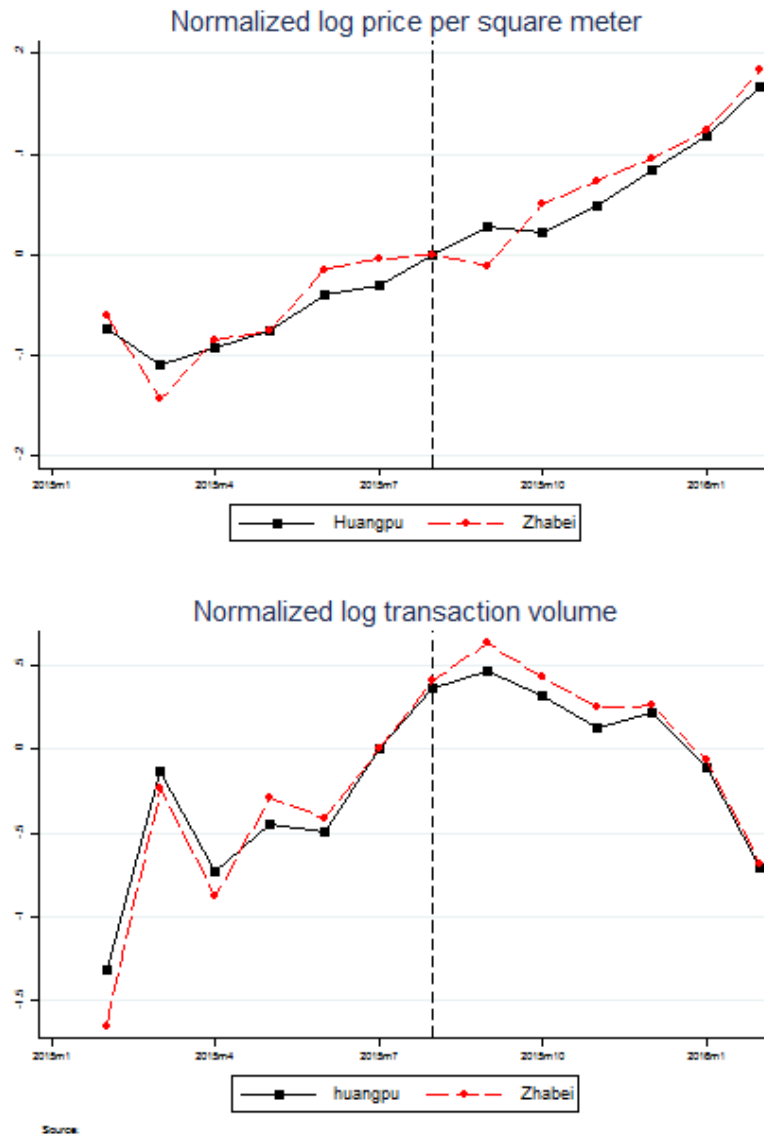
Notes: This figure reports the data on student flows between Zhabei (ZB) and Jing'an (JA) in the years 2016 and 2017. We calculate student flows from ZB to JA as the number of ZB students who enrolled in JA top-tier high schools over the number of ZB students who enrolled in JA high schools. We calculate student flows from JA to ZB as the number of JA students who enrolled in ZB top-tier high schools over the number of JA students who enrolled in ZB high schools. The orange bars represent student flow from ZB to JA, while the blue bars the student flow from JA to ZB.

Fig. 4. The Dynamic Impact of the Merger on Total Child Expenditure



Notes: This figure presents the DiD coefficients with a 95% confidence interval in Table 4. The horizontal line indicates months where month 0 corresponds to August 2015.

Fig. 5. Housing Market In ZB *vs* HP



Notes: This figure displays the logarithms of average housing price per square meter and total transaction volume, normalized at their corresponding levels in August 2015, for all residential properties by districts over time. The dotted line indicates August 2015. The red line represents Zhabei district and the black line Huangpu district. Data is obtained from China Real Estate Price Platform run by China Real Estate Association.

# Tables

Table 1: Summary Statistics for Main Variables

VARIABLES	N	mean	sd	p50	min	max
<i>Panel A: Full Sample of Zhabei and Huangpu</i>						
Total expenditure	3,788,260	1,897.03	14,228.96	400.00	1.01	9,721,200.00
Credit	2,122,671	1,262.39	6,660.32	300.34	1.04	3,534,023.00
Debit	1,665,589	2,705.82	20,069.56	600.00	1.01	9,721,200.00
Child expenditure	3,788,260	11.96	415.49	0.00	0.00	150,258.00
EC	3,788,260	9.71	409.25	0.00	0.00	150,258.00
OCS	3,788,260	2.24	70.25	0.00	0.00	42,723.00
<i>Panel B: Zhabei Sample</i>						
Total expenditure	3,542,071	1,792.95	14,407.52	386.50	1.04	9,721,200.00
Credit	1,975,140	1,123.05	6,272.79	288.56	1.04	3,534,023.00
Debit	1,566,931	2,637.36	20,453.67	569.80	1.05	9,721,200.00
Child expenditure	3,542,071	12.20	407.38	0.00	0.00	105,876.00
EC	3,542,071	9.87	400.71	0.00	0.00	104,800.00
OCS	3,542,071	2.33	71.83	0.00	0.00	42,723.00
<i>Panel C: Huangpu Sample</i>						
Total expenditure	246,189	3,394.49	11,247.16	1,180.50	1.01	2,008,622.00
Credit	147,531	3,127.88	10,378.80	1,005.50	1.40	2,008,622.00
Debit	98,658	3,793.17	12,422.41	1,591.62	1.01	823,804.70
Child expenditure	246,189	8.42	518.33	0.00	0.00	150,258.00
EC	246,189	7.43	516.70	0.00	0.00	150,258.00
OCS	246,189	0.99	41.16	0.00	0.00	9,736.00
<i>Panel D: Jing'an Sample</i>						
Total expenditure	1,607,768	1,949.14	12,209.49	447.10	1.01	4,010,000.00
Credit	1,008,700	1,442.68	7,711.95	343.10	1.05	1,900,984.00
Debit	599,068	2,801.91	17,285.13	669.00	1.01	4,010,000.00
Child expenditure	1,607,768	15.98	462.40	0.00	0.00	70,000.00
EC	1,607,768	12.39	442.83	0.00	0.00	70,000.00
OCS	1,607,768	3.58	133.08	0.00	0.00	48,806.00

Notes: This table reports summary statistics for the main variables. Panel A reports the full sample including all cards in Zhabei and Huangpu districts, Panel B all cards in district Zhabei, Panel C all cards in district Huangpu, and Panel D all cards in district Jing'an.



Table 2: Summary Statistics for Subsample of Cardholders with Young Children

Variable	N	mean	sd	p50	min	max
<i>Panel A: Full Sample</i>						
Total expenditure	79,032	2,092.72	9,021.31	511.10	1.60	1,200,000.00
Credit	70,264	1,830.09	5,661.05	483.00	1.60	272,000.00
Debit	8,768	4,197.35	21,721.38	1,000.00	2.00	1,200,000.00
Child expenditure	79,032	468.19	2,775.91	0.00	0.00	150,258.00
EC	79,032	458.61	2,773.93	0.00	0.00	150,258.00
OCS	79,032	9.57	87.90	0.00	0.00	5,702.00
<i>Panel B: Zhabei Sample</i>						
Total expenditure	76,630	2,069.88	8,938.48	510.00	1.60	1,200,000.00
Credit	68,456	1,811.65	5,595.35	483.00	1.60	272,000.00
Debit	8,174	4,232.47	21,946.20	1,000.00	2.00	1,200,000.00
Child expenditure	76,630	466.04	2,688.65	0.00	0.00	105,876.00
EC	76,630	456.22	2,686.53	0.00	0.00	104,800.00
OCS	76,630	9.83	89.05	0.00	0.00	5,702.00
<i>Panel C: Huangpu Sample</i>						
Total expenditure	2,402	2,821.38	11,329.04	548.59	3.50	387,009.40
Credit	1,808	2,528.10	7,718.77	482.91	3.50	150,258.00
Debit	594	3,714.09	18,359.01	900.00	6.00	387,009.40
Child expenditure	2,402	536.56	4,787.76	0.00	0.00	150,258.00
EC	2,402	535.05	4,787.81	0.00	0.00	150,258.00
OCS	2,402	1.51	33.80	0.00	0.00	1,000.00

Notes: This table reports summary statistics for the main variables of a subsample that only includes cardholders identified as having pre-high-school children. Panel A reports the full subsample including all such cards in Zhabei and Huangpu, Panel B all such cards in district Zhabei, and Panel C all such cards in district Huangpu.

Table 3: Baseline DiD Results

Dep. Var.	(1)	(2)	(3)	(4)	(5)	(6)
	Child Expenditure			Total Expenditure		
	Total	EC	OCS	Total	Credit	Debit
After*Zhabei	0.0256*** (0.0026)	0.0045*** (0.0017)	0.0213*** (0.0019)	-0.0101 (0.0081)	-0.0045 (0.0104)	-0.0198 (0.0129)
Card Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,182	2,111,732	1,659,450
R-squared	0.001	0.001	0.001	0.005	0.005	0.004

Notes: This table reports the differences in expenditure between cardholders in Zhabei district and Huangpu district before and after the merger. Zhabei is a dummy variable that equals 1 if a cardholder resides in district Zhabei, and 0 if in Huangpu. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Dependent variables in Columns (1)-(3) are total child spending, extra-curriculum spending (EC) and other child support spending(OCS), respectively. Dependent variable in Column (4) is total expenditure. Columns (5) and (6) examine total expenditure by credit and debit cards separately. The baseline specification includes card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 4: Dynamic Impacts of the Merger on Expenditure

Panel A				
Dep. Var.	(1)	(2)	(3)	(4)
	Child Expenditure			Total
	Total	EC	OCS	Expenditure
April'15*Zhabei	-0.0038 (0.00587)	-0.0054 (0.00422)	0.0016 (0.00407)	-0.0085 (0.0167)
May*Zhabei	-0.0079 (0.00586)	-0.0059 (0.00405)	-0.0020 (0.00423)	-0.0092 (0.0162)
June*Zhabei	0.0226*** (0.00563)	0.0190*** (0.00419)	0.0037 (0.00378)	0.0025 (0.0158)
July*Zhabei	0.0007 (0.00541)	0.0009 (0.00373)	-0.0002 (0.00392)	-0.0084 (0.0153)
Sep*Zhabei	0.0357*** (0.00577)	0.0182*** (0.00405)	0.0180*** (0.00420)	 (0.0153)
Oct*Zhabei	0.0148*** (0.00557)	-0.0018 (0.00405)	0.0167*** (0.00382)	0.0105 (0.0151)
Nov*Zhabei	0.0245*** (0.00494)	0.0044 (0.00328)	0.0202*** (0.00378)	-0.0568*** (0.0151)
Dec*Zhabei	0.0259*** (0.00483)	0.0031 (0.00318)	0.0228*** (0.00364)	-0.0731*** (0.0150)
Jan'16*Zhabei	0.0515*** (0.00509)	0.0227*** (0.00324)	0.0294*** (0.00394)	-0.0083 (0.0154)
Feb*Zhabei	0.0180*** (0.00536)	-0.0018 (0.00372)	0.0198*** (0.00386)	0.0103 (0.0154)
March*Zhabei	0.0326*** (0.00551)	0.0003 (0.00361)	0.0324*** (0.00419)	0.0237 (0.0161)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3,788,260	3,788,260	3,788,260	3,788,260
R-squared	0.001	0.001	0.001	0.005

Panel B: EC Seasonality	
Dep. Var.	EC
June'15* Zhabei	0.0042 (0.0040)
Sep* Zhabei	0.0032 (0.0048)
Jane'16* Zhabei	0.0117*** (0.0039)
Jane* Zhabei	0.0198*** (0.0046)
Card Fixed Effect	Yes
Month Fixed Effect	Yes
R-squared	0.0002
N	1,734,740

Notes: This table reports the dynamic effect of the merger on cardholders in Zhabei district relative to those in Huangpu district. Zhabei is a dummy variable that equals 1 if a cardholder resides in district Zhabei, and 0 if in Huangpu. Columns (1)-(4) include the full sample and take month August 2015 as the reference month. Dependent variables in Columns (1)-(3) are total child spending, extra-curriculum spending (EC) and other child support spending(OCS), respectively. Dependent variable in Column (4) is total expenditure. Column (5) analyzes seasonality of EC by including Jan 2015, June 2015, Sep 2015, Jan 2016, and June 2016, and takes Jan 2015 as the reference month. All dependent variables are in logarithm. We include card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 5: Young Children Subsample: the DID Results

Dep. Var.	(1)	(2)	(3)	(4)
	Child expenditure			Total expenditure
	Total	EC	OCS	
After*Zhabei	0.285*** (0.0777)	0.153** (0.0747)	0.140*** (0.0212)	-0.001 (0.0673)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	78,532	78,532	78,532	78,532
R-squared	0.011	0.035	0.037	0.006

Notes: This table reports the DiD results for a subsample that only includes cardholders who are identified as having pre-high-school children. Zhabei is a dummy variable that equals 1 if a cardholder resides in district Zhabei, and 0 if in Huangpu. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Dependent variables in Columns (1)-(3) are total child spending, extra-curriculum spending (EC) and other child support spending (OCS), respectively. Dependent variable in Column (4) is total expenditure. We include card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 6: Heterogeneous Effects of the Merger: Cardholders with Children *vs* the Others

Dep. Var.	(1)	(2)	(3)	(4)
	Child Expenditure			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.0197*** (0.00221)	0.0015 (0.00104)	0.0182*** (0.00194)	-0.0103 (0.00817)
After*Child	-0.0788 (0.0753)	-0.0576 (0.0724)	-0.0211 (0.0199)	0.0072 (0.0670)
After*Zhabei* Child	0.251*** (0.0774)	0.136* (0.0743)	0.122*** (0.0213)	0.0053 (0.0679)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,182
R-squared	0.002	0.001	0.001	0.005

Notes: This table reports the results of a cross-sectional analysis of the effect of the merger with respect to having young children. Child is a dummy variable that equals 1 if a cardholder is identified as having young children, and 0 otherwise. Zhabei is a dummy variable that equals 1 if a cardholder resides in district Zhabei, and 0 if in Huangpu. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Dependent variables in Columns (1)-(3) are total child spending, extra-curriculum spending (EC) and other child support spending (OCS), respectively. Dependent variable in Column (4) is total expenditure. We include card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 7: Heterogeneous Effects of the Merger: Distance to the Old Border

Dep. Var.	(1)	(2)	(3)	(4)	(5)
	Child Expenditure			OCS	Total Expenditure
	Total	EC	EC (Seasonality)		
After*Far	-0.0162*** (0.0044)	-0.0010 (0.0022)	-0.0091* (0.0052)	-0.0152*** (0.0039)	-0.0064 (0.0107)
Card Fixed Effect	Yes	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	405,169	405,169	137,561	405,169	405,169
R-squared	0.0014	0.0017	0.0013	0.0009	0.0049

Notes: This table reports the DiD results for a subsample that only includes cardholders who are identified as residing within 2km of underground stations Hanzhong Road and Gongkang Road. Far is a dummy variable that equals 1 if the cardholder resides within 2km of underground stations Gongkang Road, and 0 if within 2km of Hanzhong Road. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Dependent variables in Columns (1)-(4) are total child spending, extra-curriculum spending (EC) and other child support spending (OCS), respectively. Dependent variable in Column (5) is total expenditure. We include card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 8: Heterogeneous Effects of the Merger: Personal Income

Dep. Var.	(1)	(2)	(3)	(4)
	Child Expenditure			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.0200*** (0.002)	0.001 (0.001)	0.017*** (0.002)	-0.009 (0.008)
After*Income	-0.174 (0.179)	-0.151 (0.176)	-0.023 (0.029)	0.140 (0.109)
After*Zhabei*Income	0.352* (0.180)	0.236 (0.177)	0.124*** (0.029)	-0.120 (0.109)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,182
R-squared	0.002	0.001	0.001	0.005

Notes: The table presents the results of a cross-sectional analysis of the effect of the merger with respect to personal income. Income is proxied as the average historical monthly total expenditure for each card. Zhabei is a dummy variable that equals 1 if a cardholder resides in district Zhabei, and 0 if in Huangpu. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Dependent variables in Columns (1)-(3) are total child spending, extra-curriculum spending (EC) and other child support spending (OCS), respectively. Dependent variable in Column (4) is total expenditure. We include card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 9: Debit Card Subsample: the DiD Results

Panel A: Debit Card Sample				
Dep. Var.	(1)	(2)	(3)	(4)
	Child Expenditure			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.0111*** (0.0027)	0.0042** (0.0106)	0.0070*** (0.0020)	-0.0198 (0.0129)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	1,659,450	1,659,450	1,659,450	1659450
R-squared	0.0002	0.0000	0.0002	0.0043
Panel B: Debit Card & Young Children Sample				
After*Zhabei	0.4008*** (0.1417)	0.2942** (0.1403)	0.1188*** (0.0227)	0.1320 (0.1275)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	8,705	8,705	8,705	8,705
R-squared	0.0021	0.0005	0.0050	0.0074

Notes: The panel A of this table reports the DiD results for a subsample that includes only debit cards. The panel B presents the DiD results for a subsample that includes debit cards that are identified as having pre-high-school children. Zhabei is a dummy variable that equals 1 if a cardholder resides in district Zhabei, and 0 if in Huangpu. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Dependent variables in Columns (1)-(3) are total child spending, extra-curriculum spending (EC) and other child support spending (OCS), respectively. Dependent variable in Column (4) is total expenditure. We include card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .



Table 10: Placebo Test: Adult Children Subsample

Dep. Var.	(1)	(2)	(3)	(4)
	Child Expenditure			Total Expenditure
	Total	EC	OCS	
After*Zhabei	0.0319 (0.0662)	-0.0169 (0.0513)	0.0488 (0.0418)	-0.4491*** (0.0800)
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	238,274	238,274	238,274	238,274
R-squared	0.000	0.000	0.000	0.004

Notes: This table reports the DiD results in a subsample only includes cardholders who are identified as having old children or no children. Zhabei is a dummy variable that equals 1 if a cardholder resides in district Zhabei, and 0 if in Huangpu. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Dependent variables in Columns (1)-(3) are total child spending, extra-curriculum spending (EC) and other child support spending (OCS), respectively. Dependent variable in Column (4) is total expenditure. We include card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 11: Alternative Mechanism: Housing

<i>Panel A: Triple Interaction</i>				
Dep. Var.	(1)	(2)	(3)	(4)
	Child Expenditure			Total Expenditure
	Total	EC	OCS	
After*Zhabei*House	0.192 (0.1718)	0.176 (0.1717)	0.016** (0.0072)	0.556* (0.3114)
Other Interactions	Yes	Yes	Yes	Yes
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,182
R-squared	0.001	0.001	0.001	0.005
<i>Panel B: Fourth Interaction</i>				
After*Zhabei*Child*House	-0.264 (0.220)	-0.226 (0.215)	-0.031 (0.047)	-0.748** (0.337)
Other Interactions	Yes	Yes	Yes	Yes
Card Fixed Effect	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes
Observations	3,771,182	3,771,182	3,771,182	3,771,182
R-squared	0.002	0.001	0.001	0.005

Notes: The panel A of this table presents the results of a cross-sectional analysis of the effect of the merger with respect to property ownership. The panel B presents the results of a cross-sectional analysis within a group that identified as having pre-high-school children, whether the effects of the merger differ between cardholders with and without properties. House is a dummy variable that equals 1 if a cardholder is identified as having properties in his or her own district, and 0 otherwise. Child is a dummy variable that equals 1 if a cardholder is identified as having young children, and 0 otherwise. Zhabei is a dummy variable that equals 1 if a cardholder resides in district Zhabei, and 0 if in Huangpu. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Dependent variables in Columns (1)-(3) are total child spending, extra-curriculum spending (EC) and other child support spending (OCS), respectively. Dependent variable in Column (4) is total expenditure. We include other interactions, card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*  $p < 0.01$ , \*  $p < 0.05$ ,  $p < 0.1$ .

Table 12: The Impact of the Merger: Jing'an *vs* Huangpu

Dep. Var.: Child Expenditure	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Full Sample EC	OCS	Young Children Total	Subsample EC	OCS
After*Jing'an	0.010*** (0.0027)	0.002 (0.0017)	0.008*** (0.0020)	0.127* (0.0715)	0.077 (0.0695)	0.051*** (0.0196)
Card Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Month Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,837,605	1,837,605	1,837,605	90,358	90,358	90,358
R-squared	0.000	0.000	0.000	0.002	0.002	0.001

Notes: This table reports the differences in expenditure between cardholders in Jing'an and Huangpu before and after the merger. Jing'an is a dummy variable that equals 1 if a cardholder resides in district Jing'an, and 0 if in Huangpu. After is a dummy variable that equals 1 if the month is after August 2015, and 0 otherwise. All dependent variables are in logarithm. Columns (1)-(3) examine the full sample, and Columns (4)-(6) the subsample that includes only cardholders that are identified as having pre-high-school children. Dependent variables in Columns (1)-(3) or (4)-(6) are total child spending, extra-curriculum spending (EC) and other child support spending (OCS), respectively. The baseline specification includes card fixed-effects and month fixed-effects. Standard errors in parenthesis are clustered at the card level: \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

## Appendix 1. Variable Definitions

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Variables	Definitions
Total consumption	Monthly total expenditure of each card
Kid consumption	Monthly total expenditure on child-related items of each card
Extra-curriculum spending (EC)	EC includes expenditure on private institutions that provide extra-curriculum training and on stationary
Other child spending (OCS)	OCS includes expenditure on children clothing, toys, and zoos
After	Dummy variable that equals 1 if the month is after August, 2015, and 0 otherwise
Zhabei	Dummy variable that equals 1 if a cardholder resides in the district Zhabei, and 0 otherwise
Kid	Dummy variable that equals 1 if a cardholder spent on EC, OSC, formal schooling that is before high schools, and children hospitals one year before the merger, and 0 otherwise
Far	Dummy variable that equals 1 if a cardholder lives within 2 km of Gongkang Road Station, and 0 if within 2 km of Hanzhong Road Station
Income	Mean of monthly total consumption for each card before the merger
House	Dummy variable that equals 1 if a cardholder made payments to local property services agencies and real estate agencies one year before the merger, and 0 otherwise
Jing'an	Dummy variable that equals 1 if a cardholder resides in the district Jing'an, and 0 otherwise

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Figure A 1. Shanghai Map

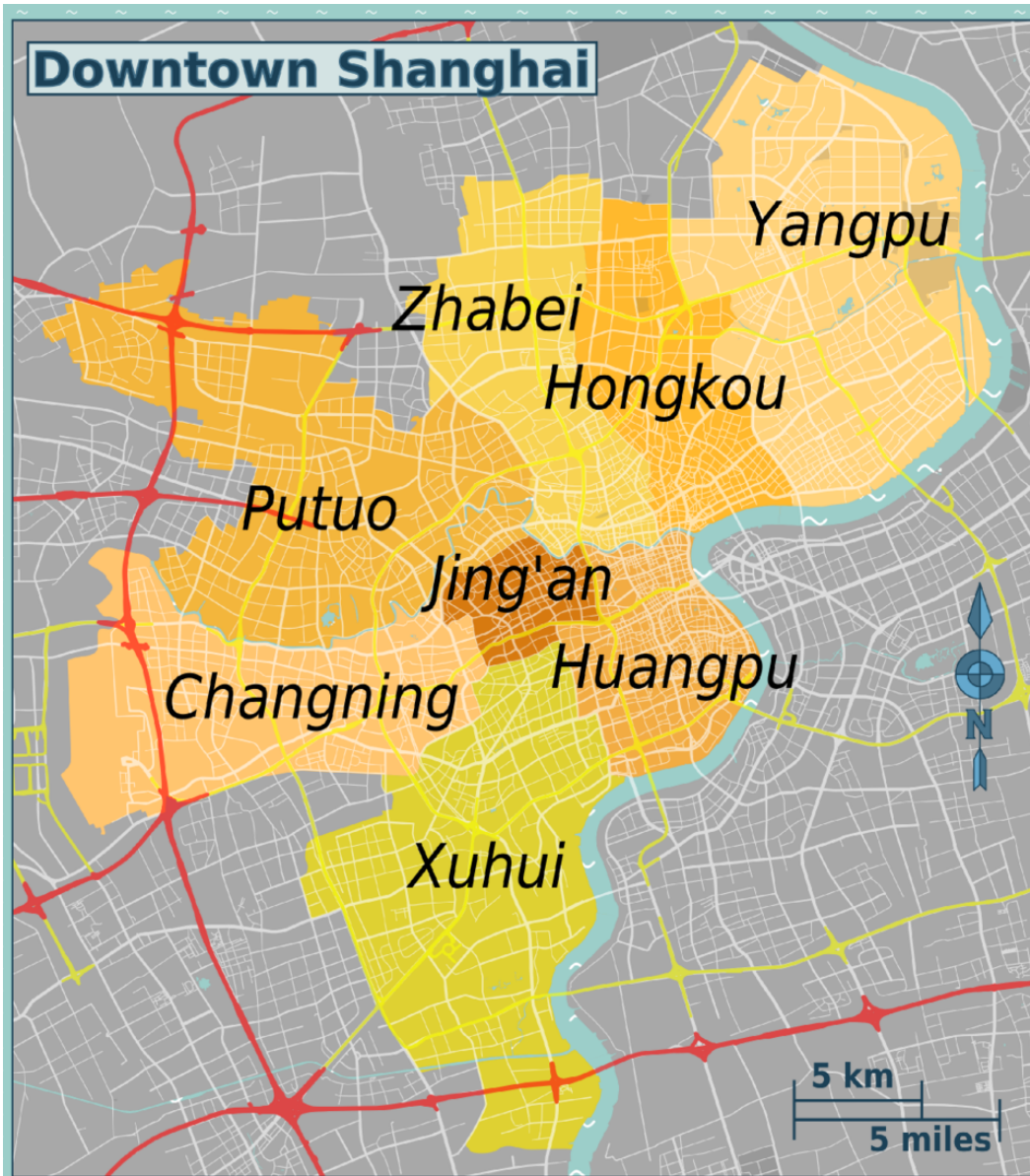


Figure A 2. Public School Entrance in Shanghai

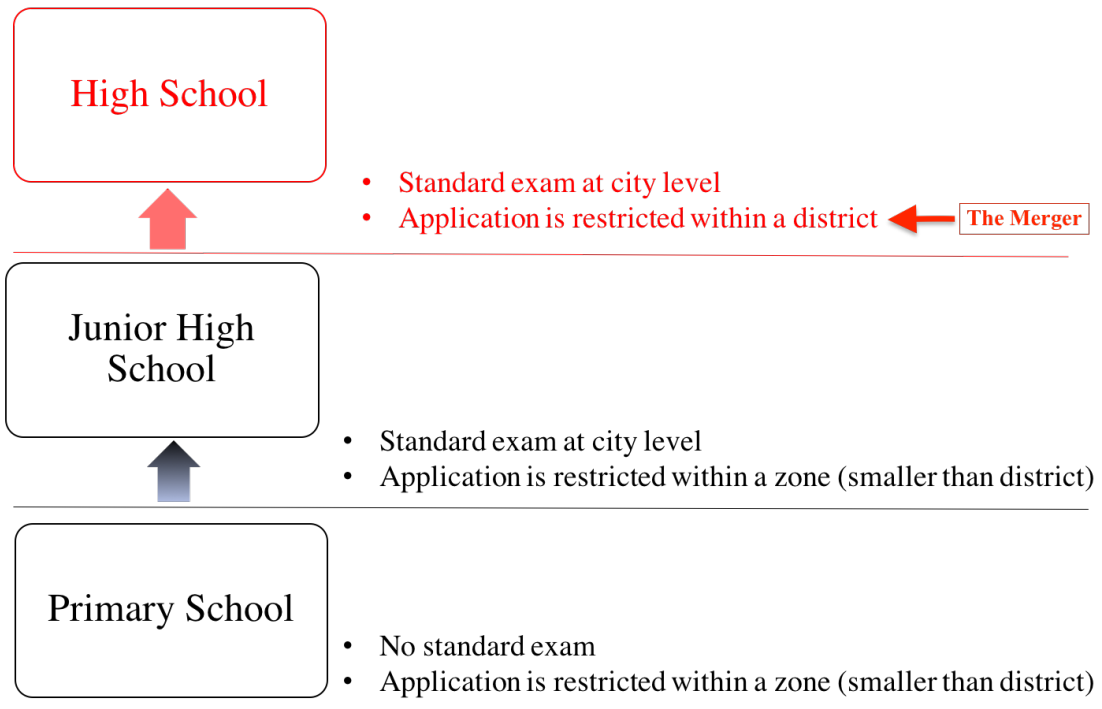


Figure A 3. Underground stations Along Line 1 in Shanghai

