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Citation of published version:
Luo, J., Henderson, D. (2021): Minimum Wage Changes across Provinces in China: Average Treatment Effects on Employment and Investment Decisions. *Risk and Financial Management.* 14(1).

DOI: https://doi.org/10.3390/jrfm14010022

Journal of
*Risk and Financial Management*

MDPI

*Article*

# Minimum Wage Changes across Provinces in China: Average Treatment Effects on Employment and Investment Decisions

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**Abstract:** We exploit data from the China Household Finance Survey to examine the impact of changes in the minimum wage on employment and investment decisions. We are able to non-parametrically identify the average treatment effect on the treated via exogenous variation in the minimum wage across provinces. We find that changes in the minimum wage had no adverse effects on employment (in terms of days worked per month or hours worked per work day) but found evidence that changes in the minimum wage impacted the percentage of families that had a bank account, a family in a rural area owned their home, and whether families (whose highest level of education was primary school) planned to purchase a home.

**Keywords:** housing; minimum wage; non-parametric; treatment effects

**JEL Classification:** C12; J31; O18



**Citation:** Luo, Ji, and Daniel J. Henderson. 2021. Minimum Wage Changes Across Provinces in China: Average Treatment Effects on Employment and Investment Decisions. *Journal of Risk and Financial Management* 14: 22. https://doi.org/10.3390/jrfm14010022

Received: 30 October 2020
Accepted: 22 December 2020
Published: 5 January 2021



## 1. Introduction

Economic theory suggests that an increase in the minimum wage, *ceteris paribus*, will have adverse effects on employment. However, more recently, economists have argued that modest increases in the minimum wage do not have *significant* adverse effects on employment. The most influential study is arguably Card and Krueger (1994). In their large study of the fast-food industry, they found insignificant impacts of the minimum wage on employment across US state lines. If their results are true, then it is possible that increases in the minimum wage may have positive benefits to society for at least a portion of society.

In this paper, we take a unique representative dataset of Chinese households to study the impact of the minimum wage on employment of individuals and financial decisions of households.[1] We are able to exploit (arguably) exogenous shocks (to the households) of increases in the minimum wage that occur across provinces. During the time period under consideration (2015–2017), some provinces had increases in their minimum wages while others did not. We have access to repeated cross-sections of surveys in the summers of 2015 and 2017 to analyze the impacts of these treated and controlled households.

Using a methodology which non-parametrically identifies the average treated effect on the treated ($ATET$) population, we do not find significant adverse effects on employment in terms of days worked per month or hours worked per work day. This holds true regardless of the level of disaggregation. For example, we separately look at individuals who live in rural or urban areas as well as individuals with different education levels. With regard to investment decisions, we find some significant impacts of minimum wage changes.

[1] See Yang and Gunderson (2011) and Yang and Gunderson (2019) for studies on the impacts of minimum wage changes on wages, employment and hours in China.

Specifically, we find increases in the percentage of families that have a bank account as well as positive impacts on home ownership in rural areas. Finally, we find positive effects of the belief that households will purchase a home for those households where the highest level of education is primary school.

The remainder of our paper proceeds as follows: Section 2 discusses identification of our $ATET$ as well as the proposed estimation method. Section 3 discusses our data source as well as the descriptive statistics in each time period. Our results are discussed in Section 4 and we conclude in Section 5. The full set of results and R code are available upon request. The data are not publicly available, but can be requested from the Survey and Research Center for China Household Finance (https://chfs.swufe.edu.cn/).

## 2. Methodology

In our application, we consider individuals/families who reside in a province that did not have a change in the minimum wage (control) and individuals who reside in a province which did have a change in the minimum wage (treated). We observe these individuals/families both before (2015) and after (2017) the introduction of the (arguably) exogenous treatment (an unanticipated hike in the minimum wage). Our goal is to estimate the average treatment effect for the treated ($ATET$) individuals via looking at differences in their respective outcomes before and after the treatment.[2] More formally, assuming we only observe the individuals in two time periods ($T = 1$ and $T = 0$), and assigning those in the treatment group as $D = 1$ and those in the control group $D = 0$, we are interested in

$$\Delta Y_{T=1,D=1} - \Delta Y_{T=1,D=0} = (Y_{T=1,D=1} - Y_{T=0,D=1}) - (Y_{T=1,D=0} - Y_{T=0,D=0}).$$

Note that we are assuming that the time trend is the same in both the treated and control groups. This is often referred to as the common trend (CT) assumption (or the parallel path assumption). More formally, we assume that the control group followed the same trend in the treatment group as in the control group over the period $[T = 1, T = 0]$;

$$E\left[Y^0_{T=1} - Y^0_{T=0}|D = 1\right] = E\left[Y^0_{T=1} - Y^0_{T=0}|D = 0\right].$$

Exploiting this assumption allows us to identify the counterfactual non-treatment outcome as

$$E\left[Y^0_{T=1}|D = 1\right] = E\left[Y^0_{T=0}|D = 1\right] + E\left[Y^0_{T=1} - Y^0_{T=0}|D = 0\right]$$

and noting that the potential outcome ($Y^0$) is the observed outcome of $Y$ if in the control group, then

$$E\left[Y^0_{T=1}|D = 1\right] = E[Y_{T=0}|D = 1] + E[Y_{T=1} - Y_{T=0}|D = 0].$$

The counterfactual outcome ($E\left[Y^0_{T=1}|D = 1\right]$) can now be constructed using

$$E\left[Y^0_{T=1}|D = 1\right] = E[Y|D = 1, T = 0] + E[Y|D = 0, T = 1] - E[Y|D = 0, T = 0],$$

for which the three terms on the right-hand side can be estimated via sample averages.

This allows us to identify the $ATET$ as

$$\begin{aligned} ATET &= E\left[Y^1_{T=1} - Y^0_{T=1}|D = 1\right] \\ &= [E(Y|D = 1, T = 1) - E(Y|D = 1, T = 0)] \\ &- [E(Y|D = 0, T = 1) - E(Y|D = 0, T = 0)], \end{aligned}$$

[2] We note that portions of our text follow the excellent textbook of Frölich and Sperlich (2019).

where each of the four elements after the second equality sign can be estimated via sample averages.

We note here that our estimate of $ATET$ is non-parametrically identified and requires no functional form restrictions for estimation. While the procedure and estimation method are relatively simple, it is non-parametric.[3]

## 3. Data

Our data come directly from the China Household Finance Survey (CHFS) from the Survey and Research Center for China Household Finance. These data are not publicly available, but researchers can apply by registering at the website for the Survey and Research Center for China Household Finance (https://chfs.swufe.edu.cn/). The surveys were conducted in June of 2015 and 2017 via in person questionnaires. The surveyors (students from Southwestern University of Finance and Economics) visited the interviewees door to door.[4]

The Survey and Research Center for China Household Finance is a non-profit academic research institution established by Southwestern University of Finance and Economics in 2010. It has built databases for the China Household Finance Survey and the China Micro and Small Enterprise Survey (CMES). Four waves of the CHFS were conducted in June of 2011, 2013, 2015, and 2017. We obtained the CHFS data for 2015 and 2017 with the goal of analyzing the impact of minimum wage changes on employment and investment behavior of the families sampled in the data. These surveys were conducted via questionnaires. The 2015 CHFS randomly investigated 37,289 families in 29 provinces (including municipalities and autonomous regions), and the 2017 CHFS investigated 40,011 families. These samples should be treated as repeated cross-sections.

Table 1 lists two outcome variables of interest for employment (in 2016 and 2017) and eleven outcome variables of interest (in 2015 and 2017) regarding investment decisions. The data on employment are for individual family members; the data for investment decisions are at the family level. We consider two questions related to employment status. The questionnaire asked how many working days the individual did on average work during the second half of 2016, and separately, how many working days did the individual on average work during the first half of 2017. Similarly, the questionnaire asked how many hours the individual worked on average per working day in the latter half of 2016 and how many hours did the individual work on average per working day during the first half of 2017. The eleven investment behavior variables investigated were obtained from both the 2015 and 2017 CHFS data. These include the same questions listed in Table 1 in each time period.

The summary statistics are given in the table. We can see that the averages and standard deviations across the two time periods (for all provinces) are relatively stable. For example, most people own the house they are living in (roughly 85% in each time period). Individuals on average work 24 days a month and close to nine hours per day. There is clearly some amount of significant variation as we see the number of homes and apartments own range from a minimum of zero in each time period to a maximum of 50 and 27 in 2015 and 2017, respectively. Recall that our sample is a repeated cross-section and does not imply a loss in homes to a particular family.

[3] The careful reader will recogonize that in the setting without confounders that this estimator will be equivalent to that of a least-squares estimator with regressors for treatment status, time and an interaction between treatment status and time. As we wish for our estimator to be fully non-parametric, we forgo adding linear confounders and opt for splitting the sample based on characteristics of the household. Adding linear confounders requires homogeneity assumptions on the treatement effect, which are unlikely to hold in practice.

[4] The survey is used in studies in a wide variety of areas. For example, see the special issue (Vol 52, Issue 8) devoted to studies using the CHFS in *Emerging Markets Finance and Trade* Zhang (2016).

**Table 1.** Descriptive statistics of outcome variables of interest.

| 2015 | Mean | Std | Min | Max | Obs |
|---|---|---|---|---|---|
| Do you own the house or apartment in which you live? | 0.8529 | 0.3542 | 0 | 1 | 37,259 |
| How many houses and apartments do you have? | 1.1990 | 0.6090 | 0 | 50 | 34,043 |
| Do you have a plan to buy or build a new house? | 0.2090 | 0.4066 | 0 | 1 | 16,957 |
| Do you have stock accounts? | 0.1450 | 0.3521 | 0 | 1 | 25,929 |
| Did you invest in funds? | 0.0543 | 0.2266 | 0 | 1 | 24,336 |
| Did you invest in bank financial products? | 0.0473 | 0.2123 | 0 | 1 | 37,086 |
| Have you lent out money? | 0.1563 | 0.3631 | 0 | 1 | 37,094 |
| Do you have outstanding bank loans for family members' education? | 0.0095 | 0.0972 | 0 | 1 | 37,224 |
| Do you have outstanding bank loans for family members' medical treatment? | 0.0494 | 0.2167 | 0 | 1 | 37,198 |
| Do you have credit cards (excluding inactivated ones)? | 0.1777 | 0.3823 | 0 | 1 | 37,012 |
| Do you have bank accounts? | 0.8992 | 0.3011 | 0 | 1 | 24,360 |
| **2016** | **Mean** | **Std** | **Min** | **Max** | **Obs** |
| How many days in a month do you work on average? | 24.1126 | 4.8925 | 0 | 31 | 36,769 |
| How many hours in a working day do you work on average? | 8.9147 | 2.4292 | 0 | 24 | 36,769 |
| **2017** | **Mean** | **Std** | **Min** | **Max** | **Obs** |
| Do you own the house or apartment in which you live? | 0.8439 | 0.3629 | 0 | 1 | 39,986 |
| How many houses and apartments do you have? | 1.2213 | 0.5379 | 0 | 27 | 36,163 |
| Do you have a plan to buy or build a new house? | 0.1723 | 0.3776 | 0 | 1 | 39,924 |
| Do you have stock accounts? | 0.0862 | 0.2806 | 0 | 1 | 39,913 |
| Did you invest in funds? | 0.0311 | 0.1735 | 0 | 1 | 39,828 |
| Did you invest in bank financial products? | 0.0411 | 0.1985 | 0 | 1 | 39,820 |
| Have you lent out money? | 0.1668 | 0.3728 | 0 | 1 | 39,870 |
| Do you have outstanding bank loans for family members' education? | 0.0125 | 0.1112 | 0 | 1 | 39,963 |
| Do you have outstanding bank loans for family members' medical treatment? | 0.0509 | 0.2198 | 0 | 1 | 39,976 |
| Do you have credit cards (excluding inactivated ones)? | 0.1968 | 0.3976 | 0 | 1 | 39,792 |
| Do you have bank accounts? | 0.9012 | 0.2984 | 0 | 1 | 37,624 |
| How many days in a month do you work on average? | 24.0896 | 4.9106 | 0 | 30 | 35,063 |
| How many hours in a working day do you work on average? | 8.8733 | 2.2069 | 0 | 20 | 34,889 |

In order to get a better idea of the impacts based on sub-populations, we also separated the sampled families based on the highest individual level of education within a family, whether the family comes from an urban or rural area, and whether the family has a bank account. In the CHFS data, there is a binary variable listed for whether the family lives in a rural area. For the level of education (*edu*), nine possible levels of education are feasible: (1) no schooling at all, (2) primary school, (3) middle school, (4) traditional high school, (5) technical high school, (6) college/vocational school, (7) bachelor's degree, (8) master's degree, and (9) doctorate degree.

Table 2 shows the nominal minimum wage in each province at the beginning of each time period. It also gives any change in the minimum wage in each provincial capital, along with the date of such change. While these changes happen often, they are not uniform in terms of timing, amount, or location. We believe that they are arguably exogenous to the individual families.[5] Typically, when a new minimum wage policy is issued in a province, the minimum wages of the whole province will increase by the same amount. The provincial capital has the highest minimum wage within the province.

[5] Ideally, we would like to see empirical evidence of common trends in the outcome variables of interest. However, changes in the minimum wage occur relatively often with these samples and not uniformly. Therefore, it is infeasible to conduct such an analysis in our sample. That being said, the common trend assumption is more likely to hold over a shorter time frame such as the one we have here.

**Table 2.** Minimum wage changes across Chinese provinces: Issue dates (year.month.day) and (current value) nominal wages (in Renminbi—RMB).

| Province | Issue Date | Wage | Province | Issue Date | Wage |
|---|---|---|---|---|---|
| Beijing | 1 January 2013 | 1400 | Jilin | 1 July 2013 | 1320 |
| | 1 April 2014 | 1560 | | 1 December 2015 | 1480 |
| | 1 April 2015 | 1720 | | 1 October 2017 | 1780 |
| | 1 September 2016 | 1890 | Jiangsu | 1 July 2013 | 1480 |
| | 1 September 2017 | 2000 | | 1 November 2014 | 1630 |
| Shanghai | 1 April 2013 | 1620 | | 1 January 2016 | 1770 |
| | 1 April 2014 | 1820 | | 1 August 2018 | 2020 |
| | 1 April 2015 | 2020 | Jiangxi | 1 April 2013 | 1230 |
| | 1 April 2016 | 2190 | | 1 July 2014 | 1390 |
| | 1 April 2017 | 2300 | | 1 October 2015 | 1530 |
| | 1 April 2018 | 2420 | | 1 January 2018 | 1680 |
| Fujian | 1 August 2013 | 1320 | Inner Mongolia | 1 November 2012 | 1200 |
| | 1 July 2015 | 1500 | | 1 July 2014 | 1500 |
| | 1 July 2017 | 1700 | | 1 July 2015 | 1640 |
| Gansu | 1 April 2013 | 1200 | | 1 August 2017 | 1760 |
| | 1 April 2014 | 1350 | Ningxia | 1 May 2013 | 1300 |
| | 1 April 2015 | 1470 | | 1 November 2015 | 1480 |
| | 1 June 2017 | 1620 | | 1 October 2017 | 1660 |
| Guangdong | 1 May 2013 | 1550 | Qinghai | 1 December 2012 | 1070 |
| | 1 May 2015 | 1895 | | 1 May 2014 | 1270 |
| | 1 July 2018 | 2100 | | 1 May 2017 | 1500 |
| Liaoning | 1 July 2013 | 1300 | Shandong | 1 March 2013 | 1380 |
| | 1 January 2015 | 1530 | | 1 March 2014 | 1500 |
| | 1 January 2018 | 1620 | | 1 March 2015 | 1600 |
| Hainan | 1 December 2013 | 1120 | | 1 June 2016 | 1710 |
| | 1 January 2015 | 1270 | | 1 June 2018 | 1910 |
| | 1 May 2016 | 1430 | Shanxi | 1 April 2013 | 1290 |
| | 1 December 2018 | 1670 | | 1 April 2014 | 1450 |
| Anhui | 1 July 2013 | 1260 | | 1 May 2015 | 1620 |
| | 1 November 2015 | 1520 | | 1 October 2017 | 1700 |
| | 1 November 2018 | 1550 | | 1 January 2013 | 1150 |
| Guangxi | 1 July 2013 | 1200 | | 1 February 2014 | 1280 |
| | 26 March 2015 | 1400 | | 1 May 2015 | 1480 |
| | 1 February 2018 | 1680 | | 1 May 2017 | 1680 |
| Guizhou | 1 January 2013 | 1030 | Sichuan | 1 July 2013 | 1200 |
| | 1 July 2014 | 1250 | | 1 July 2014 | 1400 |
| | 1 October 2015 | 1600 | | 1 July 2015 | 1500 |
| | 1 July 2017 | 1680 | | 1 July 2018 | 1780 |
| Hebei | 1 December 2012 | 1320 | Tianjin | 1 April 2013 | 1500 |
| | 1 December 2014 | 1480 | | 1 April 2014 | 1680 |
| | 1 July 2016 | 1650 | | 1 April 2015 | 1850 |
| | 1 November 2019 | 1900 | | 1 July 2016 | 1950 |
| Henan | 1 January 2013 | 1240 | | 1 July 2017 | 2050 |
| | 1 July 2014 | 1400 | Yunnan | 1 May 2013 | 1265 |
| | 1 July 2015 | 1600 | | 1 May 2014 | 1420 |
| | 1 October 2017 | 1720 | | 1 September 2015 | 1570 |
| Heilongjiang | 1 December 2012 | 1160 | | 1 May 2018 | 1670 |
| | 1 October 2015 | 1480 | Zhejiang | 1 January 2013 | 1470 |
| | 1 October 2017 | 1680 | | 1 August 2014 | 1650 |
| Hubei | 1 September 2013 | 1300 | | 1 November 2015 | 1860 |
| | 1 September 2015 | 1550 | | 1 December 2017 | 2010 |
| | 1 November 2017 | 1750 | Chongqing | 1 January 2014 | 1250 |
| Hunan | 1 December 2013 | 1265 | | 1 January 2016 | 1500 |
| | 1 January 2015 | 1390 | | 1 January 2019 | 1800 |
| | 1 July 2017 | 1580 | | | |

There is sufficient variation in the minimum wage across provinces along with periods whereby some provinces do not have any changes in the minimum wage. From 1 June 2016 to 1 June 2017, minimum wages changed in Beijing, Hainan, Hebei, Jilin, Shaanxi, Shandong, Shanghai, and Tianjin. We will treat these provinces (both together and separately) as treated and the remaining provinces (both together and separately) as control groups to examine changes in employment with respect to changes in the minimum wage. Similarly, from 1 June 2015 to 1 June 2017, Gansu, Guangdong, Guangxi, Huna, Liaoning, Qinghai, and Shanxi did not experience a change in their minimum wages. We will use these provinces (both together and separately) as our control groups to examine how changes in the minimum wage in the remaining provinces (both together and separately) led to changes in investment decisions.

## 4. Results

In this section, we present our main results. We begin by naively looking at all provinces which had changes in their minimum wages versus all provinces that did not have changes in their minimum wages. These estimates are less informative given that minimum wages changed by different amounts in different time periods for each province. We therefore, for each outcome variable, disaggregate the estimates for each treated province versus each control province separately. We further do so by different attributes to see if the impact differs by factors such as families who live in urban versus rural areas. Given that we estimated more than 15,000 treatment effects, we highlight the most significant results[6] in the text and provide the remaining estimates in an online Supplementary Materials (available upon request).

### *4.1. Differences in Means*

An anonymous referee suggested that, before looking at average treatment effects, we may be interested in simply testing differences in means between groups. It makes sense to adopt a non-parametric test here as there is no reason to believe the underlying distributions are normal or near normal. Specifically, we employ the Wilcoxon rank-sum test for differences between means (e.g., see Gibbons and Chakraborti 2011). Table 3 lists the *p*-values for each test of interest.

The first row, first column compares the average number of working days in 2016 versus the average number of working days in 2017 for all individuals in the sample. We fail to reject the null that they are equal. We find the same result for working hours in the second row. The second and third columns test the difference in the average number of working days and working hours, respectively for treated versus control provinces in 2016 and 2017, respectively. In each case, we reject the null that the two means are equal. However, we are interested in the differences in the changes over time, and this does not imply that we will find significant $ATET$ estimates.

We also ran these tests for the investment outcome variables. We found both cases whereby we rejected the nulls and cases whereby we failed to reject the nulls that the mean values were equal. For differences over time, we failed to reject the null of equality for the presence of medical loans and for the presence of a bank account. For the treated versus control provinces in 2015, we failed to reject the null for the presence of a stock account, investment in funds, owning a credit card and the presence of a bank account. The same conclusions were found in 2017. Although these results are interesting, it does not necessarily explain the relative change over time between groups. We therefore turn our attention to the $ATET$ estimates.

[6] In Tables 4–9, to avoid having the reader manually calculate significance levels but in order to minimize clutter, we list significant results in color. Specifically, for those estimates which are significant at the arbitrary 1, 5, and 10 percent levels, we use the colors, red, blue, and green, respectively.

**Table 3.** Wilcoxon rank-sum test for differences between means over time and between treated and control groups: each number refers to the *p*-value for the associated test (description of each outcome variable can be found in Table 1).

| **Outcome** | **2016 vs. 2017 (All)** | **Treated vs. Control (2016)** | **Treated vs. Control (2017)** |
|---|---|---|---|
| *employment* | | | |
| working days | 0.8414 | 0.0000 | 0.0000 |
| working hours | 0.2612 | 0.0382 | 0.0356 |
| | **2015 vs. 2017 (All)** | **Treated vs. Control (2015)** | **Treated vs. Control (2017)** |
| *investment* | | | |
| own home | 0.0005 | 0.0000 | 0.0180 |
| numbers of homes | 0.0000 | 0.0000 | 0.0000 |
| future home | 0.0000 | 0.0002 | 0.0000 |
| stock accounts | 0.0000 | 0.4491 | 0.1608 |
| invest in funds | 0.0000 | 0.9439 | 0.7495 |
| bank products | 0.0000 | 0.0000 | 0.0000 |
| lend money | 0.0001 | 0.0318 | 0.0000 |
| education loans | 0.0001 | 0.0303 | 0.0007 |
| medical loans | 0.3334 | 0.0001 | 0.0444 |
| credit cards | 0.0000 | 0.8154 | 0.3959 |
| bank account | 0.4041 | 0.5650 | 0.7816 |

### *4.2. All Treated versus All Control Provinces*

Table 4 gives the results for both employment and investment outcomes for all treated provinces versus all control group provinces. Given that the minimum wages changed at different times and changed by different amounts, this is a bit naive, but we hope that it gives us an idea of where to head next. The first column of numbers represent the estimated $ATET$ and its corresponding standard error for all individuals in our sample.[7] The second column has the analogous results for individuals with a bank account. The third and fourth columns are for individuals from urban and rural areas, respectively. Finally, the last four columns are for different levels of education. $edu \leq 2$ represents individuals with primary schooling or less, $edu \leq 3$ are for individuals with junior high school education or less, $edu \geq 3$ are for individuals with junior high school education or more and, finally, $edu \geq 4$ are for individuals with a high school education or above. Our expectation is that individuals in rural areas, those without a bank account and those with lower levels of education are more likely to be impacted by changes in the minimum wage.

The upper panel is for the results on employment. We see positive values for $ATET$ on working days, but negative values for working hours. However, these estimates are insignificant. This even holds true for individuals with lower levels of education and for those who reside in rural areas. This perhaps is not surprising given that we combine all the provinces together, plus the common finding of no significant changes in employment (Card and Krueger 1994).

The lower panel of Table 4 gives the results for each of our investment outcomes. These outcomes were measured over a longer time period, 2015 to 2017. We find a large amount of variation in our estimates across different subsections of society. However, while we expected a fair amount of insignificance, the results here are perhaps surprising. We find very few cases whereby the estimate of $ATET$ is significantly different from zero. Besides the single estimate for owning ones home, we find three cases whereby the outcome (lending money) is negative and significant (for all those in rural areas and those with higher levels of education). These latter three are only significant at the ten-percent level.

[7] Given that our setting of splitting samples is equivalent to that of a least-squares estimator, the standard error is the square root of the diagonal element of the estimated variance–covariance matrix of the relevant parameter estimate. Note again that we have a repeated cross-section and therefore do not require adjustments for autocorrelation.

**Table 4.** *ATET* estimates (with their corresponding standard error beneath) for all treated vs. all control provinces for both employment and investment outcomes (units of measurement are further described in Table 1): For all families and for families whereby (1) someone has a bank account, (2) reside in an urban or (3) reside in a rural area, and by (4) education level (<2 primary school or below, ≤3 junior high or below, ≥3 junior high or above, and ≥4 high school or above)—Significance of point estimates at the arbitrary 1, 5, and 10 percent levels are colored red, blue, and green, respectively.

| Outcome | All | Bank | Urban | Rural | $edu \leq 2$ | $edu \leq 3$ | $edu \geq 3$ | $edu \geq 4$ |
|---|---|---|---|---|---|---|---|---|
| *employment* | | | | | | | | |
| working days | 0.0578 | 0.0142 | 0.0565 | 0.0954 | 0.0676 | 0.1541 | 0.0551 | −0.0167 |
| | 0.0808 | 0.0817 | 0.0866 | 0.1990 | 0.3050 | 0.1443 | 0.0813 | 0.0895 |
| working hours | −0.0160 | −0.0113 | −0.0185 | 0.0077 | −0.0948 | −0.0559 | −0.0052 | 0.0011 |
| | 0.0385 | 0.0390 | 0.0433 | 0.0841 | 0.1390 | 0.0681 | 0.0391 | 0.0426 |
| *investment* | | | | | | | | |
| own home | −0.0073 | −0.0138 | −0.0102 | 0.0030 | −0.0057 | −0.0103 | −0.0058 | −0.0042 |
| | 0.0058 | 0.0069 | 0.0078 | 0.0068 | 0.0160 | 0.0093 | 0.0063 | 0.0074 |
| number of homes | −0.2033 | −0.3224 | −0.0686 | −0.4785 | −0.0069 | −0.2065 | −0.2319 | −0.2006 |
| | 0.1584 | 0.2097 | 0.1395 | 0.3844 | 0.0159 | 0.2312 | 0.1840 | 0.2140 |
| future home | −0.0055 | −0.0033 | −0.0015 | −0.0139 | 0.0247 | 0.0059 | −0.0072 | −0.0081 |
| | 0.0079 | 0.0097 | 0.0095 | 0.0140 | 0.0159 | 0.0113 | 0.0088 | 0.0107 |
| stock accounts | −0.0008 | 0.0024 | −0.0019 | −0.0038 | 0.0015 | −0.0059 | −0.0002 | 0.0019 |
| | 0.0056 | 0.0066 | 0.0074 | 0.0031 | 0.0039 | 0.0045 | 0.0062 | 0.0081 |
| invest in funds | −0.0009 | −0.0010 | −0.0003 | −0.0037 | 0.0018 | 0.0003 | −0.0006 | −0.0008 |
| | 0.0036 | 0.0043 | 0.0048 | 0.0020 | 0.0032 | 0.0030 | 0.0040 | 0.0052 |
| bank products | 0.0000 | −0.0052 | 0.0009 | −0.0030 | 0.0005 | 0.0007 | 0.0006 | 0.0004 |
| | 0.0033 | 0.0043 | 0.0047 | 0.0019 | 0.0026 | 0.0027 | 0.0039 | 0.0052 |
| lend money | −0.0114 | −0.0069 | −0.0100 | −0.0167 | −0.0026 | −0.0127 | −0.0118 | −0.0100 |
| | 0.0060 | 0.0075 | 0.0076 | 0.0094 | 0.0105 | 0.0080 | 0.0067 | 0.0083 |
| education loans | −0.0018 | −0.0022 | 0.0002 | −0.0058 | −0.0015 | −0.0010 | −0.0018 | −0.0023 |
| | 0.0017 | 0.0020 | 0.0016 | 0.0041 | 0.0021 | 0.0014 | 0.0019 | 0.0026 |
| medical loans | 0.0047 | 0.0035 | 0.0013 | 0.0136 | 0.0154 | 0.0056 | 0.0038 | 0.0040 |
| | 0.0035 | 0.0037 | 0.0034 | 0.0083 | 0.0122 | 0.0068 | 0.0036 | 0.0038 |
| credit cards | −0.0049 | 0.0000 | −0.0095 | 0.0012 | 0.0069 | 0.0039 | −0.0047 | −0.0078 |
| | 0.0064 | 0.0080 | 0.0085 | 0.0070 | 0.0067 | 0.0060 | 0.0072 | 0.0093 |
| bank account | −0.0035 | | −0.0045 | −0.0116 | −0.0275 | −0.0038 | −0.0002 | −0.0011 |
| | 0.0055 | | 0.0060 | 0.0125 | 0.0256 | 0.0117 | 0.0053 | 0.0055 |

At this point, one may be skeptical and think that there is not much to gain from such a short time period, but these estimates are naive and we must look at provinces individually against one another. We have many families in each province in each time period and, by looking at them separately, we can look at a single change in the minimum wage. It turns out that such segregation will allow us to find significant effects, even over a relatively short time period. We study this more formally in the next sub-section.

### *4.3. Provincial Level Employment Outcomes*

The province by province *ATET* estimates for employment outcomes are given in Tables 5 and 6 for the number of working days in a month and number of hours worked per working day, respectively. Each column represents a province whereby the minimum wage changed (treated provinces) and each row represents a province whereby the minimum wage did not change (control provinces). For example, the first value in the first row is the estimated *ATET* for Beijing versus Anhui. It attempts to measure the impact of an increase in the minimum wage on the number of working days for individuals in Beijing versus Anhui (for all individuals in each of these provinces in our sample). The estimate, if taken literally, says that the increase in the minimum wage in Beijing led to an additional 0.2463 days worked per month (relative to Anhui). This would represent roughly a 1%

increase in employment. However, it is important to point out that the corresponding standard error is 0.2628 and hence the point estimate is insignificant.

If we continue down the rows, we see that nearly all $ATET$s are insignificant for Beijing other than for Inner Mongolia. Here, we see a much larger increase than for other cases and a relatively small standard error. It turns out the impact versus Inner Mongolia is also significant relative to Hebei, Jilin, and Shanghai. One possible explanation for this result stems from the fact that Inner Mongolia is a resource rich (autonomous region) province. The remainder of the point estimates in this table are insignificant. This is not necessarily surprising given the results in the literature.

**Table 5.** $ATET$ estimates (with corresponding standard error listed beneath) for each treated (column) vs. each control (row) province (for all individuals) for the number of working days: Significance of point estimates at the arbitrary 1, 5, and 10 percent levels are colored red, blue, and green, respectively—a box is given for the control province most closely aligned with the treatment province in terms of absolute minimum wage.

| Province | Beijing | Hainan | Hebei | Jilin | Shaanxi | Shandong | Shanghai | Tianjin |
|---|---|---|---|---|---|---|---|---|
| Anhui | 0.2463 | −0.0555 | 0.2513 | 0.4356 | 0.1812 | 0.0144 | 0.0760 | −0.0897 |
| | 0.2628 | 0.3397 | 0.2986 | 0.3451 | 0.2992 | 0.2570 | 0.2419 | 0.3129 |
| Chongqing | 0.2412 | −0.0606 | 0.2462 | 0.4306 | 0.1761 | 0.0093 | 0.0709 | −0.0948 |
| | 0.2547 | 0.3266 | 0.2807 | 0.3281 | 0.2848 | 0.2426 | 0.2332 | 0.3035 |
| Fujian | 0.1282 | −0.1736 | 0.1332 | 0.3175 | 0.0631 | −0.1037 | −0.0421 | −0.2078 |
| | 0.2290 | 0.2916 | 0.2454 | 0.2900 | 0.2519 | 0.2129 | 0.2088 | 0.2732 |
| Gansu | 0.2134 | −0.0885 | 0.2183 | 0.4027 | 0.1482 | −0.0186 | 0.0430 | −0.1227 |
| | 0.2797 | 0.3631 | 0.3229 | 0.3710 | 0.3215 | 0.2773 | 0.2582 | 0.3328 |
| Guangdong | 0.2748 | −0.0271 | 0.2798 | 0.4641 | 0.2096 | 0.0429 | 0.1044 | −0.0613 |
| | 0.1976 | 0.2490 | 0.2030 | 0.2440 | 0.2122 | 0.1772 | 0.1789 | 0.2361 |
| Guangxi | −0.1545 | −0.4564 | −0.1496 | 0.0348 | −0.2197 | −0.3865 | −0.3249 | −0.4906 |
| | 0.2656 | 0.3464 | 0.3116 | 0.3559 | 0.3084 | 0.2671 | 0.2460 | 0.3158 |
| Guizhou | −0.0433 | −0.3452 | −0.0383 | 0.1460 | −0.1085 | −0.2752 | −0.2137 | −0.3793 |
| | 0.3319 | 0.4309 | 0.3833 | 0.4403 | 0.3816 | 0.3291 | 0.3064 | 0.3948 |
| Heilongjiang | 0.3395 | 0.0377 | 0.3445 | 0.5289 | 0.2744 | 0.1076 | 0.1692 | 0.0035 |
| | 0.2832 | 0.3627 | 0.3104 | 0.3636 | 0.3156 | 0.2684 | 0.2591 | 0.3377 |
| Henan | 0.1578 | −0.1440 | 0.1628 | 0.3471 | 0.0926 | −0.0741 | −0.0126 | −0.1782 |
| | 0.2623 | 0.3363 | 0.2893 | 0.3380 | 0.2933 | 0.2499 | 0.2402 | 0.3126 |
| Hubei | 0.0194 | −0.2824 | 0.0244 | 0.2088 | −0.0457 | −0.2125 | −0.1509 | −0.3166 |
| | 0.2407 | 0.3077 | 0.2621 | 0.3078 | 0.2672 | 0.2269 | 0.2200 | 0.2870 |
| Hunan | 0.0660 | −0.2358 | 0.0710 | 0.2553 | 0.0008 | −0.1659 | −0.1043 | −0.2700 |
| | 0.2537 | 0.3230 | 0.2719 | 0.3213 | 0.2791 | 0.2359 | 0.2313 | 0.3027 |
| Jiangsu | 0.2510 | −0.0509 | 0.2560 | 0.4403 | 0.1858 | 0.0191 | 0.0806 | −0.0850 |
| | 0.2243 | 0.2855 | 0.2400 | 0.2838 | 0.2465 | 0.2083 | 0.2045 | 0.2676 |
| Jiangxi | 0.0652 | −0.2367 | 0.0702 | 0.2545 | 0.0000 | −0.1668 | −0.1052 | −0.2709 |
| | 0.2745 | 0.3585 | 0.3235 | 0.3690 | 0.3196 | 0.2772 | 0.2544 | 0.3264 |
| Liaoning | 0.0349 | −0.2670 | 0.0399 | 0.2242 | −0.0303 | −0.1970 | −0.1355 | −0.3012 |
| | 0.2391 | 0.3029 | 0.2512 | 0.2991 | 0.2600 | 0.2185 | 0.2173 | 0.2854 |
| Inner Mongolia | 0.9008 | 0.5989 | 0.9058 | 1.0901 | 0.8356 | 0.6689 | 0.7304 | 0.5648 |
| | 0.3768 | 0.4952 | 0.4541 | 0.5139 | 0.4449 | 0.3881 | 0.3506 | 0.4474 |
| Ningxia | 0.4318 | 0.1299 | 0.4368 | 0.6211 | 0.3666 | 0.1998 | 0.2614 | 0.0957 |
| | 0.3104 | 0.4072 | 0.3719 | 0.4217 | 0.3652 | 0.3180 | 0.2886 | 0.3688 |
| Qinghai | 0.4932 | 0.1914 | 0.4982 | 0.6826 | 0.4281 | 0.2613 | 0.3229 | 0.1572 |
| | 0.3037 | 0.3912 | 0.3410 | 0.3957 | 0.3433 | 0.2939 | 0.2790 | 0.3616 |
| Shanxi | −0.0616 | −0.3635 | −0.0566 | 0.1277 | −0.1268 | −0.2935 | −0.2320 | −0.3976 |
| | 0.2557 | 0.3267 | 0.2780 | 0.3266 | 0.2836 | 0.2406 | 0.2336 | 0.3049 |
| Sichuan | 0.1442 | −0.1576 | 0.1492 | 0.3336 | 0.0791 | −0.0877 | −0.0261 | −0.1918 |
| | 0.2451 | 0.3130 | 0.2656 | 0.3125 | 0.2713 | 0.2300 | 0.2239 | 0.2924 |
| Yunnan | −0.0006 | −0.3024 | 0.0044 | 0.1888 | −0.0657 | −0.2325 | −0.1709 | −0.3366 |
| | 0.2904 | 0.3757 | 0.3309 | 0.3819 | 0.3312 | 0.2846 | 0.2675 | 0.3457 |
| Zhejiang | 0.1596 | −0.1423 | 0.1646 | 0.3489 | 0.0944 | −0.0723 | −0.0108 | −0.1764 |
| | 0.2223 | 0.2815 | 0.2330 | 0.2778 | 0.2414 | 0.2027 | 0.2020 | 0.2654 |

When this many comparisons exist, it makes sense to consider if one comparison is more relevant than another. An anonymous referee suggested that we use an approach to match treated and control provinces. We considered several different measures, but ended up using the minimum wage in each province. In other words, for each treated province, we found the control province with the closest minimum wage. In Table 5 onward, this comparison is featured via a box around the point estimate and standard error. For example, for Beijing that comparison province is Zhejiang (a coastal province near Shanghai).

**Table 6.** *ATET* estimates (with corresponding standard error listed beneath) for each treated (column) vs each control (row) province (for all individuals) for the number of working hours per working day: Significance of point estimates at the arbitrary 1, 5 and 10 percent levels are colored red, blue and green, respectively—a box is given for the control province most closely aligned with the treatment province in terms of absolute minimum wage.

| Province | Beijing | Hainan | Hebei | Jilin | Shaanxi | Shandong | Shanghai | Tianjin |
|---|---|---|---|---|---|---|---|---|
| Anhui | −0.0468 | −0.1798 | 0.0063 | −0.0265 | −0.0413 | −0.0784 | −0.0562 | −0.0725 |
| | 0.1317 | 0.1538 | 0.1379 | 0.1700 | 0.1410 | 0.1216 | 0.1274 | 0.1553 |
| Chongqing | −0.0181 | −0.1510 | 0.0350 | 0.0022 | −0.0126 | −0.0497 | −0.0275 | −0.0438 |
| | 0.1272 | 0.1501 | 0.1306 | 0.1616 | 0.1352 | 0.1154 | 0.1215 | 0.1504 |
| Fujian | −0.0006 | −0.1336 | 0.0524 | 0.0196 | 0.0048 | −0.0322 | −0.0101 | −0.0263 |
| | 0.1031 | 0.1216 | 0.1058 | 0.1309 | 0.1095 | 0.0935 | 0.0985 | 0.1219 |
| Gansu | 0.0756 | −0.0574 | 0.1287 | 0.0959 | 0.0811 | 0.0440 | 0.0662 | 0.0499 |
| | 0.1511 | 0.1770 | 0.1572 | 0.1940 | 0.1614 | 0.1387 | 0.1455 | 0.1783 |
| Guangdong | −0.0423 | −0.1753 | 0.0107 | −0.0221 | −0.0369 | −0.0739 | −0.0518 | −0.0681 |
| | 0.0866 | 0.1036 | 0.0864 | 0.1074 | 0.0909 | 0.0765 | 0.0812 | 0.1027 |
| Guangxi | −0.0712 | −0.2042 | −0.0181 | −0.0510 | −0.0658 | −0.1028 | −0.0807 | −0.0969 |
| | 0.1284 | 0.1471 | 0.1389 | 0.1703 | 0.1394 | 0.1221 | 0.1269 | 0.1507 |
| Guizhou | 0.1180 | −0.0150 | 0.1711 | 0.1382 | 0.1234 | 0.0864 | 0.1085 | 0.0923 |
| | 0.1653 | 0.1918 | 0.1751 | 0.2155 | 0.1779 | 0.1542 | 0.1611 | 0.1946 |
| Heilongjiang | −0.0563 | −0.1893 | −0.0033 | −0.0361 | −0.0509 | −0.0879 | −0.0658 | −0.0821 |
| | 0.1413 | 0.1670 | 0.1445 | 0.1789 | 0.1499 | 0.1277 | 0.1346 | 0.1671 |
| Henan | −0.0788 | −0.2118 | −0.0257 | −0.0585 | −0.0733 | −0.1104 | −0.0882 | −0.1045 |
| | 0.1273 | 0.1498 | 0.1312 | 0.1622 | 0.1355 | 0.1159 | 0.1219 | 0.1504 |
| Hubei | −0.0551 | −0.1881 | −0.0020 | −0.0348 | −0.0496 | −0.0867 | −0.0645 | −0.0808 |
| | 0.1175 | 0.1390 | 0.1201 | 0.1487 | 0.1246 | 0.1061 | 0.1119 | 0.1390 |
| Hunan | −0.0098 | −0.1428 | 0.0432 | 0.0104 | −0.0044 | −0.0414 | −0.0193 | −0.0356 |
| | 0.1208 | 0.1433 | 0.1225 | 0.1520 | 0.1277 | 0.1084 | 0.1145 | 0.1430 |
| Jiangsu | 0.0152 | −0.1178 | 0.0683 | 0.0355 | 0.0207 | −0.0164 | 0.0058 | −0.0105 |
| | 0.1051 | 0.1246 | 0.1070 | 0.1326 | 0.1113 | 0.0946 | 0.0998 | 0.1244 |
| Jiangxi | 0.0102 | −0.1228 | 0.0633 | 0.0305 | 0.0157 | −0.0214 | 0.0008 | −0.0155 |
| | 0.1456 | 0.1691 | 0.1538 | 0.1894 | 0.1565 | 0.1355 | 0.1417 | 0.1714 |
| Liaoning | 0.0453 | −0.0877 | 0.0983 | 0.0655 | 0.0507 | 0.0137 | 0.0358 | 0.0195 |
| | 0.1168 | 0.1397 | 0.1164 | 0.1448 | 0.1226 | 0.1031 | 0.1095 | 0.1385 |
| Inner Mongolia | 0.0971 | −0.0359 | 0.1501 | 0.1173 | 0.1025 | 0.0654 | 0.0876 | 0.0713 |
| | 0.1939 | 0.2220 | 0.2100 | 0.2574 | 0.2107 | 0.1846 | 0.1917 | 0.2275 |
| Ningxia | −0.0849 | −0.2179 | −0.0318 | −0.0647 | −0.0795 | −0.1165 | −0.0944 | −0.1106 |
| | 0.1578 | 0.1808 | 0.1706 | 0.2092 | 0.1713 | 0.1500 | 0.1559 | 0.1852 |
| Qinghai | 0.0546 | −0.0784 | 0.1076 | 0.0748 | 0.0600 | 0.0229 | 0.0451 | 0.0288 |
| | 0.1720 | 0.2043 | 0.1743 | 0.2162 | 0.1818 | 0.1542 | 0.1630 | 0.2037 |
| Shanxi | 0.0212 | −0.1118 | 0.0742 | 0.0414 | 0.0266 | −0.0104 | 0.0117 | −0.0046 |
| | 0.1350 | 0.1608 | 0.1358 | 0.1687 | 0.1423 | 0.1202 | 0.1273 | 0.1599 |
| Sichuan | −0.0754 | −0.2084 | −0.0223 | −0.0552 | −0.0700 | −0.1070 | −0.0849 | −0.1011 |
| | 0.1312 | 0.1566 | 0.1315 | 0.1635 | 0.1381 | 0.1164 | 0.1234 | 0.1555 |
| Yunnan | −0.1156 | −0.2486 | −0.0626 | −0.0954 | −0.1102 | −0.1472 | −0.1251 | −0.1414 |
| | 0.1439 | 0.1676 | 0.1512 | 0.1864 | 0.1543 | 0.1333 | 0.1395 | 0.1695 |
| Zhejiang | 0.0733 | −0.0597 | 0.1264 | 0.0936 | 0.0788 | 0.0417 | 0.0639 | 0.0476 |
| | 0.1116 | 0.1339 | 0.1107 | 0.1378 | 0.1169 | 0.0981 | 0.1043 | 0.1325 |

For working hours, we find similar results in Table 6. The first element in the first row represents the estimated $ATET$ for Beijing versus Anhui. It attempts to measure the impact of an increase in the minimum wage on the number of working hours in a working day for individuals in Beijing versus Anhui (for all individuals in each of these provinces in our sample). The estimate, if taken literally, says that the increase in the minimum wage in Beijing led to 0.0468 fewer hours worked per day (relative to Anhui). This point estimate takes the expected sign, but is insignificant. It appears that this holds true for each combination of treated and control provinces (including Inner Mongolia). In fact, we also broke down the estimates via the same categories as in Table 4 (e.g., urban, rural, or by education level) and found only a few cases where the results were significant (e.g., rural individuals of Inner Mongolia versus rural individuals in Beijing, Hebei, Jilin, Shanxi and Shandong).

Overall, we find little evidence that increases in the minimum wage had any impacts on employment in our survey for any group. The lone exception being estimated average treatment effects, whereby Inner Mongolia was the control group. However, we note that we did not determine Inner Mongolia to be a "preferred" comparison province to any treated province in the sample. We now turn our attention to investment outcomes.

### *4.4. Provincial Level Investment Outcomes*

While many of our point estimates are insignificant for many of our financial variables, some cases show up consistently significant. As expected, most of the situations whereby the minimum wage played a role are limited to cases of rural populations and lower levels of education (those families who are more likely to make wages near the minimum). In Tables 7–9, we present a subset of the results for province versus province $ATET$ estimates for our investment outcomes. In each table, the rows now represent the provinces whereby the minimum wage changed (treated provinces) and the columns now represent the provinces where the minimum wage did not change (control provinces). In Table 7, we look at the $ATET$ for the presence of a bank account for each province combination for all families. In Table 8, we look at the $ATET$ for home ownership for families in rural areas (note that Shanghai does not have a rural area). Finally, in Table 9, we look at the $ATET$ for whether or not the family was planning to purchase a home (for families where the highest level of education was primary school or below).

Obtaining a bank account can be thought of as a first step towards improving ones financial health (see Karlan et al. 2014; Sen and De 2018). Table 7 gives the $ATET$ estimates for each of the treated/control province pairs. For example, the first element of the first row represents the $ATET$ for the presence of a bank account for an increase in the minimum wage in Anhui versus Gansu. Given that our outcome variable is binary, we can think of this as a 8.95 percentage point increase in the percentage of families that have a bank account (relative to Gansu). This is associated with a standard error of 0.0228 and hence we argue that our point estimate is statistically significant. In fact, the majority of these point estimates are significant.

This is also true when we look at subgroups of families: those in both rural and urban areas, and for those with different education levels. It is important to note that the point estimates are larger for some of the subgroups. It turns out that the impacts are higher in rural than in urban areas. For example, that same estimate for Anhui versus Gansu is 7.12 percentage point for urban areas and 13.81 percentage point for rural areas. Similarly, the minimum wage increase had larger impacts on those with the lowest levels of education. The same estimate for Anhui versus Gansu was a whopping 20.04 percentage point for those families whose highest education level was primary school or less.

In general, it appears that an increase in the minimum wage appears to make it more likely a family opens a bank account. If it is true that opening a bank account is the first step towards financial improvement, here we argue that this is a promising positive impact of a minimum wage change.

**Table 7.** *ATET* estimates (with corresponding standard error listed beneath) for each treated (row) vs. each control (column) province (for all families) for the presence of a bank account: Significance of point estimates at the arbitrary 1, 5, and 10 percent levels are colored red, blue, and green, respectively—a box is given for the control province most closely aligned with the treatment province in terms of absolute minimum wage.

| Province | Gansu | Guangdong | Guangxi | Hunan | Liaoning | Qinghai | Shanxi |
|---|---|---|---|---|---|---|---|
| Anhui | 0.0895 | −0.0135 | −0.0213 | 0.0061 | 0.0626 | 0.1177 | 0.0058 |
| | 0.0228 | 0.0178 | 0.0233 | 0.0213 | 0.0206 | 0.0235 | 0.0222 |
| Beijing | 0.1118 | 0.0089 | 0.0011 | 0.0285 | 0.0850 | 0.1401 | 0.0282 |
| | 0.0186 | 0.0142 | 0.0189 | 0.0171 | 0.0165 | 0.0193 | 0.0180 |
| Chongqing | 0.0988 | −0.0041 | −0.0120 | 0.0154 | 0.0720 | 0.1270 | 0.0151 |
| | 0.0209 | 0.0151 | 0.0211 | 0.0186 | 0.0178 | 0.0220 | 0.0196 |
| Fujian | 0.0251 | −0.0778 | −0.0857 | −0.0583 | −0.0017 | 0.0533 | −0.0586 |
| | 0.0177 | 0.0133 | 0.0180 | 0.0162 | 0.0156 | 0.0185 | 0.0170 |
| Guizhou | 0.0908 | −0.0122 | −0.0200 | 0.0074 | 0.0639 | 0.1190 | 0.0071 |
| | 0.0231 | 0.0188 | 0.0238 | 0.0222 | 0.0216 | 0.0236 | 0.0230 |
| Hainan | 0.0405 | −0.0625 | −0.0703 | −0.0429 | 0.0136 | 0.0687 | −0.0432 |
| | 0.0191 | 0.0168 | 0.0200 | 0.0194 | 0.0192 | 0.0191 | 0.0199 |
| Hebei | 0.0970 | −0.0059 | −0.0137 | 0.0137 | 0.0702 | 0.1252 | 0.0133 |
| | 0.0210 | 0.0154 | 0.0212 | 0.0188 | 0.0180 | 0.0220 | 0.0197 |
| Heilongjiang | 0.0909 | −0.0120 | −0.0198 | 0.0076 | 0.0641 | 0.1191 | 0.0072 |
| | 0.0229 | 0.0168 | 0.0231 | 0.0205 | 0.0196 | 0.0239 | 0.0215 |
| Henan | 0.0381 | −0.0648 | −0.0726 | −0.0452 | 0.0113 | 0.0663 | −0.0456 |
| | 0.0202 | 0.0165 | 0.0208 | 0.0194 | 0.0190 | 0.0207 | 0.0202 |
| Hubei | 0.0551 | −0.0478 | −0.0556 | −0.0282 | 0.0283 | 0.0834 | −0.0285 |
| | 0.0206 | 0.0146 | 0.0207 | 0.0181 | 0.0173 | 0.0217 | 0.0192 |
| Jiangsu | 0.0222 | −0.0807 | −0.0885 | −0.0611 | −0.0046 | 0.0504 | −0.0615 |
| | 0.0209 | 0.0147 | 0.0210 | 0.0183 | 0.0173 | 0.0221 | 0.0193 |
| Jiangxi | 0.1782 | 0.0753 | 0.0675 | 0.0949 | 0.1514 | 0.2064 | 0.0945 |
| | 0.0234 | 0.0187 | 0.0241 | 0.0222 | 0.0215 | 0.0240 | 0.0230 |
| Jilin | 0.0362 | −0.0667 | −0.0745 | −0.0471 | 0.0094 | 0.0644 | −0.0475 |
| | 0.0221 | 0.0160 | 0.0223 | 0.0196 | 0.0187 | 0.0233 | 0.0207 |
| Inner Mongolia | 0.0887 | −0.0143 | −0.0221 | 0.0053 | 0.0618 | 0.1169 | 0.0050 |
| | 0.0260 | 0.0234 | 0.0274 | 0.0268 | 0.0265 | 0.0258 | 0.0273 |
| Ningxia | 0.0957 | −0.0072 | −0.0150 | 0.0124 | 0.0689 | 0.1240 | 0.0121 |
| | 0.0245 | 0.0205 | 0.0254 | 0.0239 | 0.0234 | 0.0248 | 0.0247 |
| Shaanxi | −0.0368 | −0.1398 | −0.1476 | −0.1202 | −0.0637 | −0.0086 | −0.1205 |
| | 0.0212 | 0.0161 | 0.0216 | 0.0195 | 0.0188 | 0.0221 | 0.0204 |
| Shandong | 0.0637 | −0.0392 | −0.0470 | −0.0196 | 0.0369 | 0.0919 | −0.0200 |
| | 0.0205 | 0.0139 | 0.0205 | 0.0176 | 0.0165 | 0.0219 | 0.0187 |
| Shanghai | 0.0097 | −0.0932 | −0.1010 | −0.0736 | −0.0171 | 0.0379 | −0.0740 |
| | 0.0158 | 0.0124 | 0.0162 | 0.0149 | 0.0144 | 0.0164 | 0.0155 |
| Sichuan | 0.0496 | −0.0533 | −0.0611 | −0.0337 | 0.0228 | 0.0779 | −0.0340 |
| | 0.0193 | 0.0140 | 0.0194 | 0.0172 | 0.0165 | 0.0202 | 0.0181 |
| Tianjin | 0.2151 | 0.1122 | 0.1044 | 0.1318 | 0.1883 | 0.2434 | 0.1315 |
| | 0.0230 | 0.0169 | 0.0233 | 0.0207 | 0.0198 | 0.0241 | 0.0217 |
| Yunnan | 0.0545 | −0.0484 | −0.0562 | −0.0288 | 0.0277 | 0.0827 | −0.0292 |
| | 0.0210 | 0.0167 | 0.0216 | 0.0199 | 0.0193 | 0.0216 | 0.0207 |
| Zhejiang | 0.0272 | −0.0757 | −0.0835 | −0.0561 | 0.0004 | 0.0555 | −0.0564 |
| | 0.0198 | 0.0133 | 0.0198 | 0.0168 | 0.0158 | 0.0211 | 0.0180 |

**Table 8.** *ATET* estimates (with corresponding standard error listed beneath) for each treated (row) vs. each control (column) province (for families in rural areas) for those who own their own home (note that Shanghai does not have a rural area and is hence not included in the table): Significance of point estimates at the arbitrary 1, 5, and 10 percent levels are colored red, blue, and green, respectively—a box is given for the control province most closely aligned with the treatment province in terms of absolute minimum wage.

| Province | Gansu | Guangdong | Guangxi | Hunan | Liaoning | Qinghai | Shanxi |
|---|---|---|---|---|---|---|---|
| Anhui | 0.1381 | −0.0827 | −0.0172 | 0.0140 | −0.0485 | 0.2144 | 0.0223 |
| | 0.0407 | 0.0383 | 0.0424 | 0.0407 | 0.0467 | 0.0474 | 0.0367 |
| Beijing | 0.2331 | 0.0124 | 0.0779 | 0.1091 | 0.0465 | 0.3095 | 0.1174 |
| | 0.0692 | 0.0766 | 0.0726 | 0.0775 | 0.0787 | 0.0762 | 0.0664 |
| Chongqing | 0.2028 | −0.0179 | 0.0476 | 0.0788 | 0.0162 | 0.2792 | 0.0871 |
| | 0.0429 | 0.0402 | 0.0447 | 0.0428 | 0.0489 | 0.0498 | 0.0385 |
| Fujian | 0.0739 | −0.1469 | −0.0814 | −0.0501 | −0.1127 | 0.1502 | −0.0418 |
| | 0.0351 | 0.0321 | 0.0365 | 0.0345 | 0.0406 | 0.0413 | 0.0315 |
| Guizhou | 0.1531 | −0.0677 | −0.0022 | 0.0291 | −0.0335 | 0.2294 | 0.0374 |
| | 0.0385 | 0.0372 | 0.0402 | 0.0393 | 0.0447 | 0.0447 | 0.0352 |
| Hainan | 0.0960 | −0.1247 | −0.0592 | −0.0280 | −0.0906 | 0.1724 | −0.0197 |
| | 0.0341 | 0.0379 | 0.0356 | 0.0387 | 0.0412 | 0.0385 | 0.0336 |
| Hebei | 0.1696 | −0.0511 | 0.0144 | 0.0456 | −0.0170 | 0.2460 | 0.0539 |
| | 0.0394 | 0.0376 | 0.0410 | 0.0398 | 0.0453 | 0.0456 | 0.0359 |
| Heilongjiang | 0.1571 | −0.0636 | 0.0019 | 0.0331 | −0.0295 | 0.2335 | 0.0414 |
| | 0.0454 | 0.0471 | 0.0473 | 0.0485 | 0.0522 | 0.0512 | 0.0428 |
| Henan | 0.0892 | −0.1315 | −0.0660 | −0.0348 | −0.0974 | 0.1656 | −0.0265 |
| | 0.0362 | 0.0371 | 0.0378 | 0.0386 | 0.0425 | 0.0415 | 0.0342 |
| Hubei | 0.1212 | −0.0996 | −0.0341 | −0.0028 | −0.0654 | 0.1975 | 0.0055 |
| | 0.0378 | 0.0359 | 0.0394 | 0.0381 | 0.0437 | 0.0440 | 0.0344 |
| Jiangsu | 0.0010 | −0.2197 | −0.1542 | −0.1230 | −0.1856 | 0.0774 | −0.1147 |
| | 0.0464 | 0.0446 | 0.0483 | 0.0469 | 0.0526 | 0.0533 | 0.0420 |
| Jiangxi | 0.2938 | 0.0731 | 0.1386 | 0.1698 | 0.1072 | 0.3702 | 0.1781 |
| | 0.0430 | 0.0422 | 0.0449 | 0.0443 | 0.0494 | 0.0495 | 0.0394 |
| Jilin | 0.0867 | −0.1341 | −0.0686 | −0.0373 | −0.0999 | 0.1630 | −0.0290 |
| | 0.0379 | 0.0360 | 0.0394 | 0.0381 | 0.0437 | 0.0440 | 0.0345 |
| Inner Mongolia | 0.1391 | −0.0817 | −0.0162 | 0.0151 | −0.0475 | 0.2154 | 0.0234 |
| | 0.0425 | 0.0491 | 0.0445 | 0.0495 | 0.0507 | 0.0470 | 0.0425 |
| Ningxia | 0.1808 | −0.0399 | 0.0256 | 0.0568 | −0.0058 | 0.2572 | 0.0651 |
| | 0.0473 | 0.0489 | 0.0495 | 0.0505 | 0.0545 | 0.0537 | 0.0442 |
| Shaanxi | −0.0095 | −0.2303 | −0.1648 | −0.1336 | −0.1961 | 0.0668 | −0.1252 |
| | 0.0450 | 0.0451 | 0.0469 | 0.0470 | 0.0516 | 0.0514 | 0.0416 |
| Shandong | 0.1321 | −0.0887 | −0.0232 | 0.0081 | −0.0545 | 0.2084 | 0.0164 |
| | 0.0421 | 0.0385 | 0.0438 | 0.0412 | 0.0479 | 0.0491 | 0.0375 |
| Sichuan | 0.0782 | −0.1425 | −0.0770 | −0.0458 | −0.1083 | 0.1546 | −0.0375 |
| | 0.0380 | 0.0353 | 0.0395 | 0.0377 | 0.0437 | 0.0444 | 0.0342 |
| Tianjin | 0.4667 | 0.2459 | 0.3114 | 0.3427 | 0.2801 | 0.5430 | 0.3510 |
| | 0.0818 | 0.0945 | 0.0859 | 0.0947 | 0.0936 | 0.0888 | 0.0802 |
| Yunnan | 0.0758 | −0.1450 | −0.0795 | −0.0482 | −0.1108 | 0.1521 | −0.0399 |
| | 0.0348 | 0.0337 | 0.0363 | 0.0357 | 0.0407 | 0.0405 | 0.0320 |
| Zhejiang | 0.0556 | −0.1652 | −0.0997 | −0.0685 | −0.1310 | 0.1319 | −0.0602 |
| | 0.0406 | 0.0352 | 0.0423 | 0.0385 | 0.0463 | 0.0482 | 0.0354 |

In Table 8, we present the results solely for rural families for the *ATET* for whether or not a family owns their home. For example, the first value in the first row represents the *ATET* for an increase in the minimum wage in Anhui versus the control province Gansu. Given that this outcome variable is also binary, the point estimates can be interpreted as the estimated percentage increase of families that own their home. This point estimate is 0.1381 or a 13.85 percentage point increase in families that own their home (relative to Gansu).

The associated standard error is 0.0407. In other words, this is a significant increase in the percentage of families that own their home. Of the 154 point estimates in the table, 86 of them are significant at the (arbitrary) 5% level.

**Table 9.** *ATET* estimates (with corresponding standard error listed beneath) for each treated (row) vs. each (column) control province (for all families where primary school is the highest level of education) for if they were planning to buy a home: Significance of point estimates at the arbitrary 1, 5, and 10 percent levels are colored red, blue, and green, respectively—a box is given for the control province most closely aligned with the treatment province in terms of absolute minimum wage.

| Province | Gansu | Guangdong | Guangxi | Hunan | Liaoning | Qinghai | Shanxi |
|---|---|---|---|---|---|---|---|
| Anhui | 0.1705 | 0.0890 | −0.0547 | 0.0339 | 0.0201 | 0.1324 | 0.0361 |
| | 0.0600 | 0.0481 | 0.0593 | 0.0489 | 0.0444 | 0.0634 | 0.0478 |
| Beijing | 0.1093 | 0.0278 | −0.1160 | −0.0273 | −0.0411 | 0.0712 | −0.0252 |
| | 0.0981 | 0.0818 | 0.0871 | 0.0780 | 0.0704 | 0.1130 | 0.0755 |
| Chongqing | 0.1180 | 0.0365 | −0.1073 | −0.0186 | −0.0324 | 0.0799 | −0.0165 |
| | 0.0507 | 0.0409 | 0.0506 | 0.0420 | 0.0381 | 0.0530 | 0.0409 |
| Fujian | 0.0269 | −0.0546 | −0.1984 | −0.1098 | −0.1235 | −0.0112 | −0.1076 |
| | 0.0653 | 0.0525 | 0.0662 | 0.0539 | 0.0496 | 0.0675 | 0.0531 |
| Guizhou | 0.0383 | −0.0432 | −0.1870 | −0.0983 | −0.1121 | 0.0002 | −0.0962 |
| | 0.0679 | 0.0544 | 0.0666 | 0.0548 | 0.0500 | 0.0723 | 0.0537 |
| Hainan | 0.3103 | 0.2287 | 0.0850 | 0.1736 | 0.1598 | 0.2721 | 0.1758 |
| | 0.1084 | 0.0850 | 0.1073 | 0.0849 | 0.0785 | 0.1149 | 0.0841 |
| Hebei | 0.1099 | 0.0284 | −0.1154 | −0.0267 | −0.0405 | 0.0718 | −0.0246 |
| | 0.0500 | 0.0400 | 0.0491 | 0.0409 | 0.0367 | 0.0529 | 0.0397 |
| Heilongjiang | 0.1011 | 0.0196 | −0.1242 | −0.0356 | −0.0493 | 0.0629 | −0.0334 |
| | 0.0698 | 0.0552 | 0.0703 | 0.0565 | 0.0518 | 0.0726 | 0.0556 |
| Henan | 0.1008 | 0.0193 | −0.1245 | −0.0359 | −0.0496 | 0.0626 | −0.0337 |
| | 0.0659 | 0.0520 | 0.0656 | 0.0530 | 0.0483 | 0.0691 | 0.0520 |
| Hubei | 0.0817 | 0.0002 | −0.1436 | −0.0549 | −0.0687 | 0.0436 | −0.0528 |
| | 0.0578 | 0.0461 | 0.0579 | 0.0473 | 0.0431 | 0.0602 | 0.0463 |
| Jiangsu | 0.1404 | 0.0588 | −0.0849 | 0.0037 | −0.0101 | 0.1022 | 0.0059 |
| | 0.0501 | 0.0409 | 0.0481 | 0.0412 | 0.0370 | 0.0541 | 0.0399 |
| Jiangxi | 0.1217 | 0.0402 | −0.1036 | −0.0150 | −0.0287 | 0.0835 | −0.0128 |
| | 0.0656 | 0.0532 | 0.0623 | 0.0528 | 0.0477 | 0.0717 | 0.0514 |
| Jilin | 0.1256 | 0.0441 | −0.0997 | −0.0110 | −0.0248 | 0.0875 | −0.0089 |
| | 0.0649 | 0.0511 | 0.0667 | 0.0531 | 0.0488 | 0.0661 | 0.0523 |
| Inner Mongolia | 0.0791 | −0.0025 | −0.1462 | −0.0576 | −0.0714 | 0.0409 | −0.0554 |
| | 0.0778 | 0.0614 | 0.0769 | 0.0619 | 0.0567 | 0.0823 | 0.0609 |
| Ningxia | 0.2038 | 0.1223 | −0.0215 | 0.0672 | 0.0534 | 0.1657 | 0.0693 |
| | 0.0927 | 0.0740 | 0.0892 | 0.0732 | 0.0670 | 0.1006 | 0.0718 |
| Shaanxi | 0.1306 | 0.0491 | −0.0947 | −0.0061 | −0.0198 | 0.0924 | −0.0039 |
| | 0.0709 | 0.0570 | 0.0674 | 0.0566 | 0.0512 | 0.0773 | 0.0551 |
| Shandong | 0.1258 | 0.0443 | −0.0995 | −0.0108 | −0.0246 | 0.0877 | −0.0087 |
| | 0.0465 | 0.0375 | 0.0455 | 0.0384 | 0.0344 | 0.0494 | 0.0371 |
| Shanghai | 0.1516 | 0.0701 | −0.0737 | 0.0150 | 0.0012 | 0.1135 | 0.0172 |
| | 0.0713 | 0.0586 | 0.0659 | 0.0573 | 0.0517 | 0.0796 | 0.0556 |
| Sichuan | 0.1651 | 0.0835 | −0.0602 | 0.0284 | 0.0147 | 0.1269 | 0.0306 |
| | 0.0637 | 0.0486 | 0.0690 | 0.0525 | 0.0487 | 0.0608 | 0.0522 |
| Tianjin | 0.1743 | 0.0928 | −0.0510 | 0.0377 | 0.0239 | 0.1362 | 0.0398 |
| | 0.0880 | 0.0723 | 0.0782 | 0.0692 | 0.0621 | 0.1010 | 0.0669 |
| Yunnan | 0.0582 | −0.0233 | −0.1671 | −0.0784 | −0.0922 | 0.0201 | −0.0762 |
| | 0.0746 | 0.0568 | 0.0792 | 0.0602 | 0.0558 | 0.0732 | 0.0599 |
| Zhejiang | 0.1216 | 0.0401 | −0.1037 | −0.0150 | −0.0288 | 0.0835 | −0.0128 |
| | 0.0471 | 0.0368 | 0.0493 | 0.0391 | 0.0357 | 0.0467 | 0.0384 |

It is important to note that we picked families that reside in rural areas for a reason. This result does not extend to the other sub-samples. The vast majority of point estimates are insignificant. In fact, for the primary education and below category ($edu \leq 2$), only 14 of the 154 $ATET$ estimates are significant. The impacts of the minimum wage only appear to have an impact on home ownership in rural areas where housing is typically much less expensive.

The final table we highlight (Table 9) shows the $ATET$ estimates for families where the highest level of education in the household is primary school or lower for the effect of the minimum wage on whether or not the family plans to buy a home. This question required a binary response; 1 if they were planning to purchase a home and 0 if not. This variable does not actually represent an actual decision that is being made, but more of an indication of the plans of the family. In that sense, positive values here may suggest that changes in the minimum wage change the mindset of the families financial situation.

The first element in the table again compares the impact of the minimum wage change in Anhui (treated) versus that relative to Gansu (control) where the minimum wage did not change. The point estimate here represents a 17.05 percentage point increase in families who plan to purchase a home (relative to Gansu). The standard error associated with this estimated $ATET$ is 0.0600. This increase in the minimum wage appears to bring a large change in the mindset of families with the lowest levels of education. This of course does not imply that the families are necessarily better off, but (we believe that) they appear to have had a change (on average) on beliefs about future outcomes.

It is important to note here that a majority of these outcomes are insignificant. The most significant results we obtain are in the first column (Gansu). Gansu is a relatively poor province whose economy mostly relies on natural resource extraction. It is also important to note that these results do not show up in the rural sample. It therefore does not appear to be a function of the housing price as with the previous table. A pessimistic view would be to state that those with lower education levels do not understand what it takes to purchase a home, but there is no justification here for such an opinion.

Overall, as opposed to the case of employment, we found many cases of significance with respect to changes in the minimum wage on investment decisions. It appears that the minimum wage had a significant impact on several variables of importance. We found the change in the minimum wage appeared to increase the percentage of families who had a bank account. While there certainly have been changes over time in terms of technology, our $ATET$ should eliminate such changes and the minimum wage appears to have made a positive impact, given that holding a minimum wage is seen as a first step to financial improvement. We also found strong positive impacts of the minimum wage on the percentage of families who were planning to buy a home. While this is perhaps more of a psychological effect, it could be an important step toward home ownership. These appear to be positive first steps that are associated with these minimum wage changes. It would be interesting to see the longer run impact on these outcome variables with future samples.

## 5. Conclusions

In this paper, we exploited a unique dataset that surveyed a representative sample of Chinese households. We were able to take arguably exogenous (to the families) shocks in minimum wages in order to examine average treatment effects on treated provinces. We studied both impacts on employment and investment outcomes. Similar to the literature, we did not find significant impacts on employment as measured by days worked or hours worked per work day. For investment decisions, we found significant impacts for the decision to open a bank account as well as the percentage of families who owned their home (in rural areas) and whether or not a family (with the highest level of education being primary school) was planning to purchase a home.

Further research should attempt to see these impacts over a longer period of time or try to isolate them into even more specific categories (say, relatively low levels of education

in rural areas) to see where the impacts are greatest. It would also be interesting to observe the families that obtained bank accounts and observe their future financial status.

**Supplementary Materials:** The following are available online at https://www.mdpi.com/1911-8074/14/1/22/s1, Tables S1–S16: Further results on employment; Tables S17–S104: Further results on investment.

**Author Contributions:** All authors contributed equally to this manuscript. All authors have read and agreed to the published version of the manuscript.

**Funding:** The authors wish to acknowledge partial support for the research from the University of Alabama, Nankai University, and the Tianjin provincial government.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The data are not publicly available, but can be requested from the Survey and Research Center for China Household Finance (https://chfs.swufe.edu.cn/).

**Conflicts of Interest:** The authors declare no conflict of interest.

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