Regional Development Discrepancies and Public Policy: Evaluating China's Western Development Strategy

Abstract: China implemented the Western Development Strategy in 2000 to address the issue of regional differences in the distribution of income after having favored the coastal region for the first two decades of its Opening and Reform Policies. While many studies have explored the importance of this policy from a both political and anthropological perspective, there has been no attempt to quantify the effect of the policy on the economies of the provinces covered. This paper seeks to address that discrepancy, using a two-way fixed effects model, testing the effect of the policy on GDP in counties that are located on the border between the "west" and other regions. This model demonstrates that the implementation of the Western Development Strategy has resulted in a 19.69% increase in GDP for western counties under study than would have been seen without the policy.

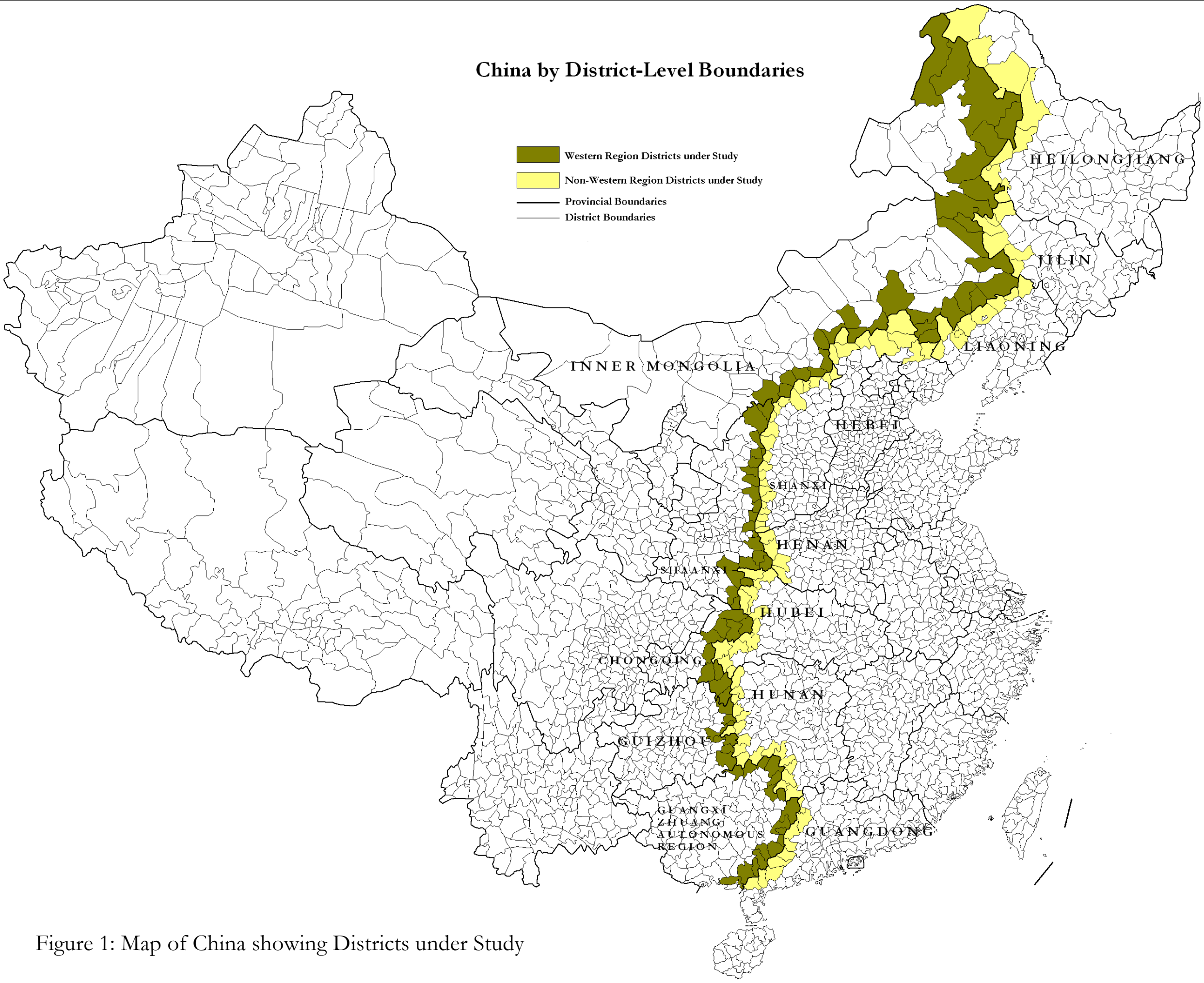

Figure 1: Map of China showing Districts under Study

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China is often broken into four main regions—coastal,[1] central,[2] northeast[3] and west.[4] For the most part, the provinces of the coast have been the main beneficiaries of China's rapid economic development since 1978. There exist major regional disparities in China's living standards, for example, gross domestic product (GDP) per capita in Guizhou, a western province, is one tenth of the level in Shanghai.[5] The government of China is concerned about the rising inequality between different regions and the potential for unrest as social instability has the potential to impact regime survival. China's western provinces are home to a large percentage of its minority groups, two of which are famous for their potential separatist movements—Tibet and Xinjiang. It is clear that there are political calculations running through China's concern for the development of the region.[6] One especially relevant development policy is China's Western Development Strategy, which was designed to raise the living standards of people in the underdeveloped western two-thirds of the country, has been marked by construction and infrastructure policies, including more than 20 major projects in the first two years after the implementation. One estimate puts the total funding devoted towards major projects in the western region under this policy at 1.8 trillion yuan by 2010 and the regional GDP growth rate reaching levels comparable to the rest of the country.[7] These projects, however, tend to be focused on areas of economic potential as well as areas where the likelihood of inter-ethnic conflict is high. Examples of this include the Qinghai-Tibet Railway project and infrastructure projects across the Uyghur Xinjiang Autonomous Region, of which the latter had growth rates comparable to the coastal region before the policy's implementation due to its natural resource wealth. It remains to be seen what this policy has actually done for the economies in the region deemed to be the west, and this is what this paper seeks to understand and explain.

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[1] Coastal provinces, or their equivalents, are: Hebei, Tianjin, Beijing, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian and Guangdong. Hebei and Guangdong are included in this analysis as they share borders with western provinces.

[2] Central provinces are: Henan, Hubei, Hunan, Anhui, Shanxi and Jiangxi. Henan, Hubei, Hunan and Shanxi are covered in this analysis.

[3] Northeastern provinces are: Heilongjiang, Jilin and Liaoning. Several of the easternmost counties in Inner Mongolia are also included in the Northeast on occasion, as they were with the "Revitalization of Northeast China" Policy. All northeastern provinces are covered in this analysis.

[4] Western provinces, or their equivalents, are: Inner Mongolia, Shaanxi, Ningxia, Xinjiang, Qinghai, Gansu, Tibet, Sichuan, Chongqing, Yunnan, Guizhou and Guangxi. Inner Mongolia, Shaanxi, Sichuan, Chongqing, Guizhou and Guangxi are covered in this analysis.

[5] Shenggen Fan, Ravi Kanbur, and Xiaobo Zhang, "China's Regional Disparities: Experience and Policy," Unpublished Draft, Dec. 2009, http://www.kanbur.aem.cornell.edu/papers/FanKanburZhangLimPaper.pdf.

[6] Nicolas Becquelin, "Staged Development in Xinjiang," The China Quarterly, 2004, p. 358-378.

[7] Lin Ling and Liu Shiqing, "Measuring the Impact of the 'Five Mega-Projects,'" China's West Region Development, World Scientific, New Jersey, 2004, p 262-263.

Literature Review

Ding Lu and Elspeth Thomson investigated the potential of the western provinces to develop based on their distance from the main urban commercial centers of Beijing/Tianjin, Shanghai and Guangzhou/Hong Kong using a gravity model, determining that infrastructure improvements could lead to further development,[8] which provides us with a baseline assumption this policy should have a positive effect on GDP. Bjorn Gustaffson, Li Shi and Terry Sicular edited a volume in which they explored inequality between classes in China. While this book does not cover extensively regional disparities, it has found that overall poverty in China has been decreasing and was based on the China Household Income Survey which covered data from 1988 to 2002.[9] Unfortunately, this data does not permit an evaluation of the Western Development Strategy due to its time limits. Their findings inform our understanding of trends in China's development, namely that overall, China's economy is growing and in doing so it is succeeding at eliminating poverty. Shanzi Ke and Edward Feser have analyzed the effects of a similar policy to the Western Development Strategy—the Rise of Central China policy, which has the same goal of developing the central region and raising living standards for its inhabitants. However, their study involved looking at the back and forth relationship between a city and its surrounding communities to determine the reverberation effect of focusing on developing urban units as drivers of economic growth. This study was expanded outside just the the central region to include four provinces that are considered by the Chinese government to be in the west.[10] Pingyu Zhang has studied the impact of the Revitalize Northeast China policy, but the paper is mostly descriptive in nature. The policy focused on reforming State-Owned Enterprises, as well as other incentives to producers and manufacturers. Zhang found that the policy was initially successful in increasing investment and employment.[11]

Experimental Framework

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[8] Ding Lu and Elspeth Thomson, "The Western Region's Growth Potential," China's West Region Development, World Scientific, New Jersey, 2004, p 239-260.

[9] Bjorn Gustaffson, Li Shi and Terry Sicular, Inequality and Public Policy in China, Cambridge University Press: 2008.

[10] Shanzi Ke and Edward Feser, "Count on the Growth Pole Strategy for Regional Economic Growth? Spread-Backwash Effects in Greater Central China," Regional Studies, Feb 2010, p 1-17.

[11] Pingyu Zhang, "Revitalizing the Old Industrial Base of Northeast China: Process, Policy and Challenge," China Geographical Society, 2008 18 (2), p 109-118.

In China, it is possible to draw a boundary between what the government has considers to be the western region and the rest of the country, or the non-west, as can be seen in Figure 1. This boundary stretches from the uppermost regions of Heilongjiang and Inner Mongolia in the northeast to the coastal boundary between Guangxi and Guangdong in the southeast, snaking its way through what many consider to be central China. This boundary touches a wide variety of different provinces and peoples; on the western side there are five adjacent provinces, and on the eastern side there are nine adjacent provinces. Because of this border, we can conduct a natural experiment to evaluate the Western Development Strategy (WDS) using a regression discontinuity design. The border between west and non-west and the eligibility for the development program are delineated geographically. The counties on either side of the border will be used as our units of observation. Because of the geographic position of these counties, they are likely to be quite similar to each other, allowing us to use the non-western counties as counterfactuals for the counties just across the border. One key identifying assumption is that these counties are largely similar, and that the boundaries are to some extent arbitrary. As they are domestic boundaries, this assumption should not be too problematic. Because there are almost a hundred counties on each side of the border, it can be assumed that the variation between them has been smoothed. Testing this using a t-test of the pretreatment data, there is no significant difference in GDP between the western and non-western counties, which verifies this assumption (Appendix Table 8). This model allows us to test for the impact of the WDS in a way that is more valid than if we were to compare provinces using controls under a simple OLS model. The model is slightly complicated by the existence of similar policies in the control groups. The Rise of Central China policy was put forth in 2003 and the Revitalize Northeast China policy came into being at the end of that same year. These policies complicate our analysis because dummy variables have been used for all the policies, and including the competing policies makes the control group look just like the treatment group. However, including controls allows us to isolate the effect of the Western Development Strategy.

Data Collection

All data for this project was collected from the All China Data Center, a project of the University of Michigan,[12] which keeps district-level data going back for many years. The most complete data is available from year 2000 onwards, with slightly less complete data before that point. The limitations of this data set have also limited to some extent this paper's analysis as the number of variables before the treatment period of 2000 mean that only certain relationships can be tested. The data was downloaded year by year for each province under study and then was merged together first by year and then by province and district. For this analysis, GDP will serve as the dependent variable as it is the best measure of a county's development and economic status available. The treatment variable, WDS, has been coded as a dummy variable that switches on for western provinces in the year 2000. Because of the existence of similar development policies in the control group, two more dummy variables have been encoded; for the Revitalization of Northeast China policy, RevitalNE switches on for northeastern provinces in 2004 and for the Rise of Central China policy, RiseCentral switches on for central provinces in 2003. These two dummy variables are included in all regressions where applicable in order to obtain correct coefficients. Additionally, there are several county-level controls that have been employed to hold differences between the counties at constant levels. These controls are population, percentage of population that is classified as rural, with the two former variables varying over time, and area of county is time invariant. While there are other variables that could be included as controls, such as number of hospital beds or education enrollment, any other controls would likely be complicate the analysis as channels of impact that would only cannibalize the treatment effect.

Methodology

Running a simple pooled OLS regression with various controls yields a positive relationship between the implementation of the WDS and GDP at highly significant levels, when including all the controls discussed above. However, this does not take into account time trends or heterogeneity between provinces, and the coefficient only represents these differences without providing a clear picture of the effects of the WDS. Using a Hausman test to determine if a random effects or fixed effects model should be utilized

[12] http://chinadataonline.org/

returns a failure to reject the null hypothesis, and so fixed effects clearly is the preferred method, as we prefer an unbiased estimator over an efficient one. Because of the structure of the data, fixed effects can be employed at the district or the provincial level. When running two-way district-level fixed effects, there is a significant coefficient of .1912, indicating that the WDS policy has a positive effect of 19.12% on GDP. This model is as follows:

$$GDP_{it} = \beta_0 + \beta_1 WDS_{igt} + \sum_{1997}^{t} \delta year_t + \beta_5 RevitalNE_{igt} + \beta_6 RiseCentral_{igt} + \alpha_i + u_{igt}$$

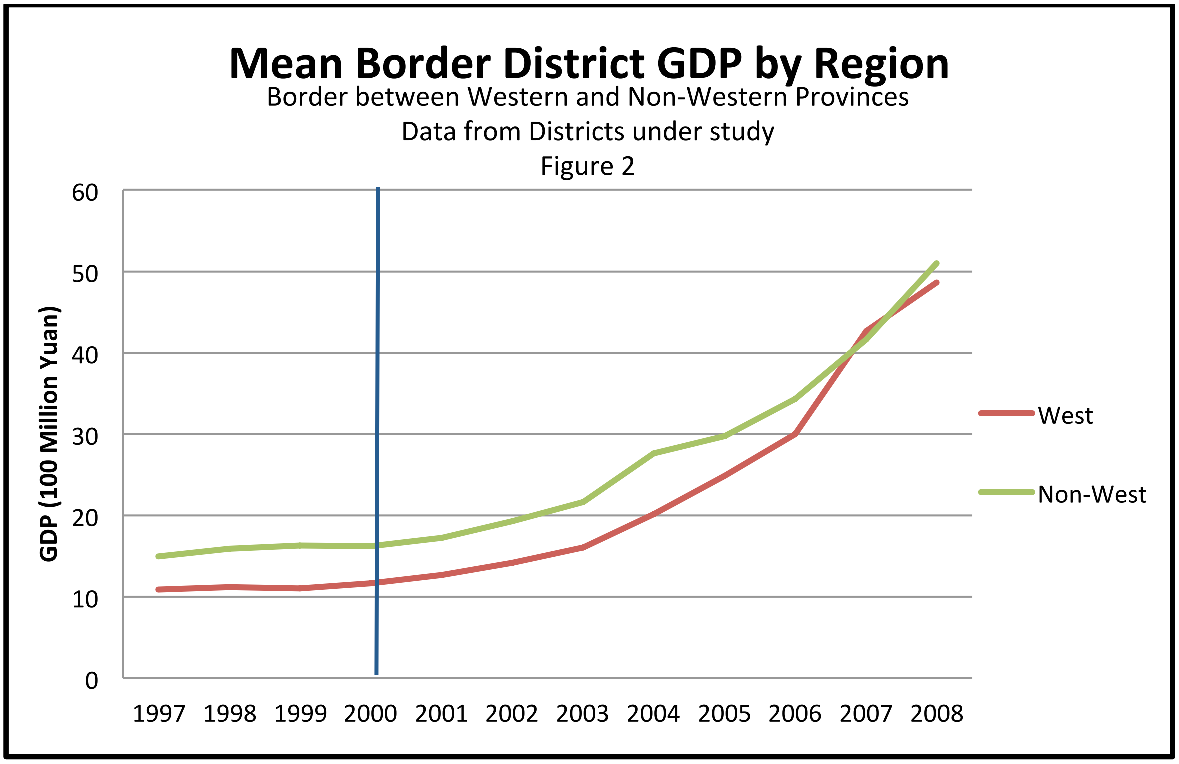
Comparing this to two-way fixed effects at the provincial level, we find a coefficient of .1969, or a 19.69% increase of GDP. These are both significant at the 1% level. Because fixed effects at the provincial level allows us to include other controls at the county level, we will proceed with this method. Using two-way fixed effects at the provincial level allows us to take into account cross-sectional endogeneity as well as panel endogeneity which was found using a false treatment effects method. This model is as follows:

$$GDP_{it} = \beta_0 + \beta_1 WDS_{igt} + \sum_{1997}^{t} \delta year_t + \beta_2 Pop_{igt} + \beta_3 Area_{ig} + \beta_4 RuralPop_{igt} + \beta_5 RevitalNE_{igt} + \beta_6 RiseCentral_{igt} + \alpha_g + u_{igt}$$

Testing for serial autocorrelation, we find that there is autocorrelation in the first and second lag. We controlled for this using Newey-West standard errors, and still found a coefficient that was significant at the 1% level with a coefficient value of .1969. However, because of the hierarchical structure of the data, we should use clustered standard errors to account for the effect of provinces being the unit of treatment while district is the unit of analysis. This yields the same coefficient, .1969, however, it is now only significant at the 10% level. Because of the structure of the data, we prefer to use clustered standard errors, especially as there is no difference in the coefficients between the coefficients when using either Newey-West or clustered standard errors.

Robustness Checks

Running a check for cross-sectional endogeneity, there is some effect of area of the counties and their GDP level on selection into the program. This is not entirely surprising, as we would expect that differences in GDP levels were one of the primary motives behind the implementation of this policy. Area may be significant because of the relative size of districts in the west, where the population is sparser. These effects will be eliminated by using a fixed effects model or by controlling for district-specific characteristics.



From Figure 2, it is apparent that we do not have a situation of panel endogeneity in which the treatment and the control were growing at different rates that did not change after the implementation of the policy. This graph also provides us with a salient representation of the changing GDP characteristics of the counties under study, with the line at 2000 marking the implementation of the WDS. Furthermore, Appendix Figure 3 demonstrates that the data is not plagued by a situation of an Ashenfelter's Dip in which there was a shock to the system before the implementation of the policy and the change reported in GDP is simply mean reversion. The graph shows that there are no shocks preceding the WDS, and this does not give cause to suspect the results. As stated before, a t-test of the pretreatment means shows that there is no significant difference between the treatment and the control groups at this period, indicating that this differentiation is a good model to use in order to simulate randomization. Further tests on differences between the treatment and control as well as the reasoning behind being a beneficiary of the WDS give us no reason to suspect the identifying assumptions of this experiment.

Testing for autocorrelation, we find that there are two lags that are significant in the residual. This implies of course that this year's GDP will influence next year's, as one would expect. In order to deal with the effect of autocorrelation, we have run several regressions, collapsing the data down to fewer periods with at least two periods between them. When running regressions for 1997, 2000, 2003 and 2006, we find that the coefficient does not change substantially, with a coefficient of .1838. This value, however, is not highly significant with a t-value of 1.53. A different approach is to use the years 1999, 2002, 2005, and 2008. This makes the data closer to current and uses the most recent data of 2008. It has a coefficient of .1853 and a t-value of 1.71, which just fails to reach 10% confidence. Leaving out more years destabilizes our coefficient, although we do get significant results at the 5% level when running the regression with only the years 1997 and 2006, with a value of .6701. However, the coefficients when leaving out the intermediate two period values, while perhaps being as high as a 1% difference in GDP, are still relatively small overall. This only further validates our original model as we still have approximated the same relationship, and we do not need to be concerned with autocorrelation too much.

A further test of the data is to only consider data for the period prior to the implementation of the Rise of Central China Policy and Revitalization of Northeast China policy, in 2003 and 2004 respectively. We have kept all data in and before 2003, and run similar analyses including using clustered standard errors at the provincial level, and removing intermediate values to eliminate the effects of autocorrelation. Overall, we find very little significance in the results. This is an indication that the effect of the WDS on GDP is a slow moving process, and it takes the full spectrum of our data to show the effects of the policy. Unfortunately, because of the competing policies in the control groups, the best we can do in analyzing the effect of the WDS on the treatment versus the control is to include control variables for the competing policies in order to knock out their effect on GDP.

Putting the data through other tests also provides some interesting information that supports the effect of the WDS on development in the region. The data set includes variables for county government expenditures and revenues (100 million yuan). Taking a difference of the two variables shows the excess expenditures that the governments are making under the project. This model is as follows:

$$DiffGovRevExp_{it} = \beta_0 + \beta_1 WDS_{igt} + \sum_{1997}^{t} \delta year_t + \beta_2 Pop_{igt} + \beta_3 Area_{ig} + \beta_4 RuralPop_{igt} + \beta_5 RevitalNE_{igt} + \beta_6 RiseCentral_{igt} + \alpha_g + u_{igt}$$

A significant coefficient on this difference shows the change that exists in government expenditures after the implementation of the WDS. A Hausman tests shows that fixed effects is preferential to random effects at both the district and provincial level. Using Newey-West and clustered standard errors provide the same coefficient of 0.2295, and with clustered standard errors, this is significant at the 10% level. This indicated that the WDS has an effect of 22.95% on the difference between revenues and expenditures, indicating an expansion in spending. However, there is serial autocorrelation in the error term after one lag. There is some destabilization in the coefficients that occurs when taking into account autocorrelation by leaving out the intermediate values, demonstrating the effect that previous values were having on the model.

It is interesting to find similar coefficients on the increase in GDP and the increase in government expenditures. This to some extent validates our assumption that government policy and spending is one of the main factors in increasing GDP in the counties under the WDS. While the findings are not statistically significant when controlling for autocorrelations, we see that government spending is a major mechanism of development under the WDS, and would expect that that spending is closely magnified in the economy as a whole. Comparing the coefficients under the main model and this model show that some of this additional spending is lost, as the coefficients do not match completely, and this may be due to spillover effects, in which some government spending benefits neighboring counties that are not included under the policy.

Endogeneity & Omitted Variable Bias

It cannot be ignored that there may be endogeneity in this model. The WDS does include infrastructure projects that will add to the GDP of the counties in which they were included. This does destabilize to some extent our confidence in the results. If we look at this from a developmental perspective, we cannot be certain that the increase in certain infrastructure projects trickle down to affect the incomes of people who live in those areas. While it is clear that better infrastructure and major development projects bring in funding and jobs, it may mean that the coefficient we have found is only demonstrative of increases in central government expenditures and not an increase in jobs or incomes. Unfortunately, there is no data available on per capita income or rural incomes that are reliable. These variables would give us a better perspective on the effects of the WDS on an individual level, but the collection of these statistics is beyond the scope of this project. In a similar vein, it would be interesting to see the effect of the WDS on incidences of ethnic violence, as controlling unrest is at least one major factor behind this policy. However, this data would be even more difficult to collect, and furthermore, the provinces covered are typically not hotbeds of ethnic unrest—only two of the five minority autonomous regions are included in the analysis, and none of the typically newsworthy regions.

There is also some concern for endogeneity in the model on excess government revenues, as we would expect that if the policy includes transfers from the central government then they would naturally show up in the dependent variable. This variable may in fact be a better independent variable to serve as a proxy for the WDS if it could be determined that the excess spending by the district government was in fact fully due to transfers from the central government. As this variable was calculated using simple subtraction, we cannot be sure what the reason for the discrepancies. Omitted variable bias for all of the models described should not be a major problem because of the use of two-way fixed effects in the model, which should eliminate most unobservables that are mostly constant across time.

Conclusion

We have determined that there has been a positive effect of nearly 20% on GDP from the Western Development Strategy and that the government's policy has improved the economies of counties on the border of the western region in comparison to their neighbors in the central, coastal and northeastern regions. This result stands up fairly well to robustness checks, though using clustered standard errors reduces our confidence in the findings to the 10% level. These findings are constrained to what we have used as the 'border area' between the western provinces and the non-western provinces. While the natural experiment allows us to find a meaningful relationship between the WDS and GDP in the counties studied, we are less able to draw inferences about the effect on counties that are far removed, as the region demarcated as the west is huge and covers heterogeneous peoples, geographical spaces and forms of government. The counties that are located on the border may benefit from their relative proximity to coastal China. However, what this analysis has demonstrated is that the WDS has had a significant positive impact on GDP in the counties where the policy has been implemented, and while the magnitude of this impact likely varies across provinces, we can expect that there is still an impact on GDP irrespective of general time trends. What we saw in the data and in Figure 2 was a surprising convergence in mean GDP across the western and non-western region border. This indicates clearly how similar these counties under study actually are and demonstrates the effectiveness of the policy.   Further study is warranted as the data only goes to 2008, and it would be interesting to run similar tests once the data for 2009 has been published to see the impact of the global financial crisis, and if there are disproportionate effects for the different regions. We might find that the economies of the western region are more fragile than their counterparts or that because some part of their economy is dependent on government transfers that they would be more insulated than their counterparts that are more dependent on exports.

Appendix

Table 1 Mean GDP by Region		
Year	**West**	**Non-West**
1997	10.88313	14.93209
1998	11.18446	15.93791
1999	11.0112	16.26341
2000	11.67738	16.2544
2001	12.6712	17.21758
2002	14.19738	19.25945
2003	16.04405	21.67846
2004	20.15536	27.58945
2005	24.86262	29.7111
2006	29.96476	34.27011
2007	42.63012	41.6333
2008	48.6512	51.00055

Table 2: Variable Description	
Variable	**Description**
Year	Year, 1997 to 2008
District_id	District, 1 to 175
Province_id	Province, 1 to 14
Region_id	Region, 1 to 4
gdp	GDP (100 million yuan)
loggdp	Log of gdp
gdplag	Lag of GDP, one period
gdppc	GDP per capital (gdp/popyrend)
popyrend	Population at the year-end (10,000 persons)
popyrendrur	Population at the year-end of which are rural (10,000 persons)
percentrur	Percentage of population which are classified as rural (popyrendrur/popyrend)
area	Area of administrative region (10,000 sq km)
govrev	Local Government Revenue (100 million yuan)
govexp	Local Government Expenditure (100 million yuan)
govtransfers	Difference of Government Revenue & Expenditure
logtransfers	Log of govtransfers
grainoutput10000tons	Grain Output (10,000 tons)
avggrain	Grain Output/Area
wds	Dummy Variable for Western Development Strategy
risecentral	Dummy Variable for Rise of Central China Policy
revitalne	Dummy Variable for Revitalize NE China Policy
treatever	Dummy Variable Indicating if the district ever benefited from WDS

Table 3
Pooled OLS Regressions

Column1	Model 1	Model 2
VARIABLES	Log GDP	Log GDP
Western Development Strategy†	0.3164***	0.4042***
	(0.047)	(0.034)
Revitalize NE China Policy†	1.0390***	0.8397***
	(0.101)	(0.073)
Rise of Central China Policy†	0.3918***	0.6421***
	(0.062)	(0.045)
Percentage Rural Population		-0.9321***
		(0.108)
Area (10,000 sq km)		0.0156
		(0.019)
Year End Population		0.0240***
		(0.001)
Constant	2.4434***	2.1151***
	(0.032)	(0.094)
Observations	2093	2068
R-squared	0.062	0.531
rmse	0.960	0.678

Notes: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
†Indicates Dummy Variable
Model 1 uses Pooled OLS
Model 2 uses Pooled OLS with Additional Controls

Table 4
Hausman Test on Log GDP at District Level

Variable	Fixed Effects	Random Effects	Difference	SE
Western Development Strategy	0.7077172	0.6259482	0.081769	0.0071576
Revitalize NE	0.9046221	0.9167243	-0.0121021	0.0111601
Rise Central China	0.7321269	0.6993432	0.0327837	0.0067784

chi2 = 641.67
Prob>chi2 = 0.0000

Table 5
Hausman Test on Log GDP at Provincial Level

Variable	Fixed Effects	Random Effects	Difference	SE
Western Development Strategy	0.6577149	0.6366768	0.0210381	0.0082378
Year End Population	0.0218364	0.0219477	-0.0001113	0.000818
Percentage Rural Population	-0.7253359	-0.7332576	0.0079217	0.0136424
Area	-0.0247071	-0.0242775	-0.0004297	.
Revitalize NE	0.9092481	0.9123883	-0.0031401	0.0122417
Rise Central China	0.6991472	0.7027372	-0.00359	0.0059114

chi2 = 13.39
Prob>chi2 = 0.0372

Table 6
Province Level Fixed Effects Models

	Model 1	Model 2	Model 3	Model 4	Model 5
VARIABLES	Log GDP	Log GDP	Log GDP	Log GDP	Log GDP
Western Development Strategy†	0.7023***	0.1846**	0.1969***	0.1969***	0.1969*
	(0.057)	(0.080)	(0.062)	(0.073)	(0.098)
Revitalize NE China Policy†	0.9046***	0.1161	0.1739**	0.1739*	0.1739
	(0.103)	(0.105)	(0.081)	(0.089)	(0.150)
Rise of Central China Policy†	0.7327***	0.0012	0.0236	0.0236	0.0236
	(0.062)	(0.076)	(0.058)	(0.085)	(0.141)
Percentage Rural Population			- 0.5283***	-0.5283**	-0.5283*
			(0.103)	(0.207)	(0.256)
Area (10,000 sq km)			-0.0119	-0.0119	-0.0119
			(0.016)	(0.019)	(0.013)
Year End Population			0.0210***	0.0210***	0.0210***
			(0.001)	(0.002)	(0.003)
Constant	2.2592***	2.1516***	1.7950***	1.3607***	1.7950***
	(0.029)	(0.054)	(0.095)	(0.162)	(0.152)
Observations	2093	2093	2068	2068	2068
R-squared	0.150	0.298	0.591		0.591
Number of Province ids	14	14	14		14
Root Mean Squared Error	0.783	0.714	0.546	.	0.545

Notes:
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
†Indicates Dummy Variable
Model 1 uses Provincial Fixed Effects
Model 2 uses Two-Way Provincial Fixed Effects
Model 3 uses Two-Way Provincial Fixed Effects with District-Level Controls
Model 4 uses Newey-West Standard Errors (2 period lag)
Model 5 uses Clustered Standard Errors at the Provincial Level

Table 7 Correcting for Autocorrelation by dropping Intermediate periods				
	Model1	**Model 2**	**Model 3**	**Model 4**
VARIABLES	Log GDP	Log GDP	Log GDP	Log GDP
Western Development Strategy†	0.1838	0.6701**	0.1853	0.5184
	(0.120)	(0.259)	(0.108)	(0.341)
Revitalize NE China Policy†	0.1194	0.4590*	0.1093	0.4372
	(0.138)	(0.247)	(0.189)	(0.393)
Rise of Central China Policy†	-0.0242	0.2918	0.0337	0.3185
	(0.113)	(0.257)	(0.159)	(0.343)
Percentage Rural Population	-0.6466**	-0.7377*	-0.6499**	-0.4377*
	(0.279)	(0.366)	(0.243)	(0.226)
Area (10,000 sq km)	-0.0098	-0.0522	-0.0719	-0.0380
	(0.011)	(0.047)	(0.041)	(0.048)
Year End Population	0.0232***	0.0241***	0.0216***	0.0211***
	(0.003)	(0.004)	(0.003)	(0.003)
Constant	2.5577***	1.7676***	1.8964***	2.5901***
	(0.184)	(0.231)	(0.139)	(0.315)
Observations	681	332	694	344
R-squared	0.581	0.634	0.624	0.686
Number of Province ids	14	14	14	14
Root Mean Squared Error	0.519	0.533	0.541	0.554

Notes: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
†Indicates Dummy Variable
Model 1 corrects for autocorrelation using data from 1997, 2000, 2003 & 2006
Model 2 corrects for autocorrelation using data from 1997 & 2006
Model 3 corrects for autocorrelation using data from 1999, 2002, 2005 & 2008
Model 4 corrects for autocorrelation using data from 1999 & 2008

Table 8 **T-test of GDP differences for Treated and Non-Treated Counties**						
Group	Obs	Mean	Std. Err.	Std. Dev.	95% Confidence Interval	
0	1001	3.278951	0.228028	7.21449	2.831482	3.72642
1	917	3.41301	0.384461	11.64224	2.658484	4.167536
Two-sample t-test with equal variances						
H0: Difference = 0						
t=-.3058; df=1916						

Table 9
Robustness Checks: Determinants of Treatment

Column1	Model 1	Model 2	Model 3
VARIABLES	Treat Ever	GDP Diff	Log GDP
Gross Domestic Product	-.0094***		
	(0.003)		
Year-End Population	0.0019	0.0073	
	(.0016)	(.007)	
Area (10,000 sq km)	0.264***	-.2095	
	(.072)	(.374)	
Percentage Rural Population	0.3827**	-3.0389***	
	(.197)	(1.460)	
Ever Treated under WDS†		-.4595	-0.6942***
		(.357)	(0.069)
Constant		2.8527***	2.7429***
		(1.287)	(0.030)
Observations	518	345	1340
R-squared	0.049	0.0219	0.071
rmse		3.247	0.980

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
†Indicates Dummy Variable
Model 1 is a Dprobit model of the determinants of treatment
Model 2 is a model of the changes in GDP
Model 3 demonstrates the effect of ever being treated on GDP

Table 10
Model Specification with Data before 2003 only

Column1	Model 1	Model 2	Model 3
VARIABLES	Log GDP	Log GDP	Log GDP
Western Development Strategy†	0.1237*	0.1247	0.1869
	(0.066)	(0.109)	(0.153)
Rise of Central China Policy†	0.0417	0.0113	0.0767
	(0.077)	(0.083)	(0.073)
Percentage Rural Population	-0.6638**	-0.6470**	-.6869***
	(0.271)	(0.266)	(0.294)
Area (10,000 sq km)	-0.0094	0.0005	0.0015
	(0.015)	(0.008)	(0.007)
Year End Population	0.0237***	0.0235***	0.0235***
	(0.003)	(0.003)	(0.003)
Constant	1.8076***	1.7618***	1.7463***
	(0.177)	(0.175)	(0.194)
Observations	1214	522	348
R-squared	0.532	0.534	0.534
Number of Province ids	14	14	14
Root Mean Squared Error	0.479	0.490	0.513

Notes: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
†Indicates Dummy Variable
Model 1 uses clustered Standard Errors
Model 2 corrects for autocorrelation, using only data from 1997, 2000, & 2003 with clustered SE
Model 3 corrects for autocorrelation, using only data from 1997 & 2003, with clustered SE

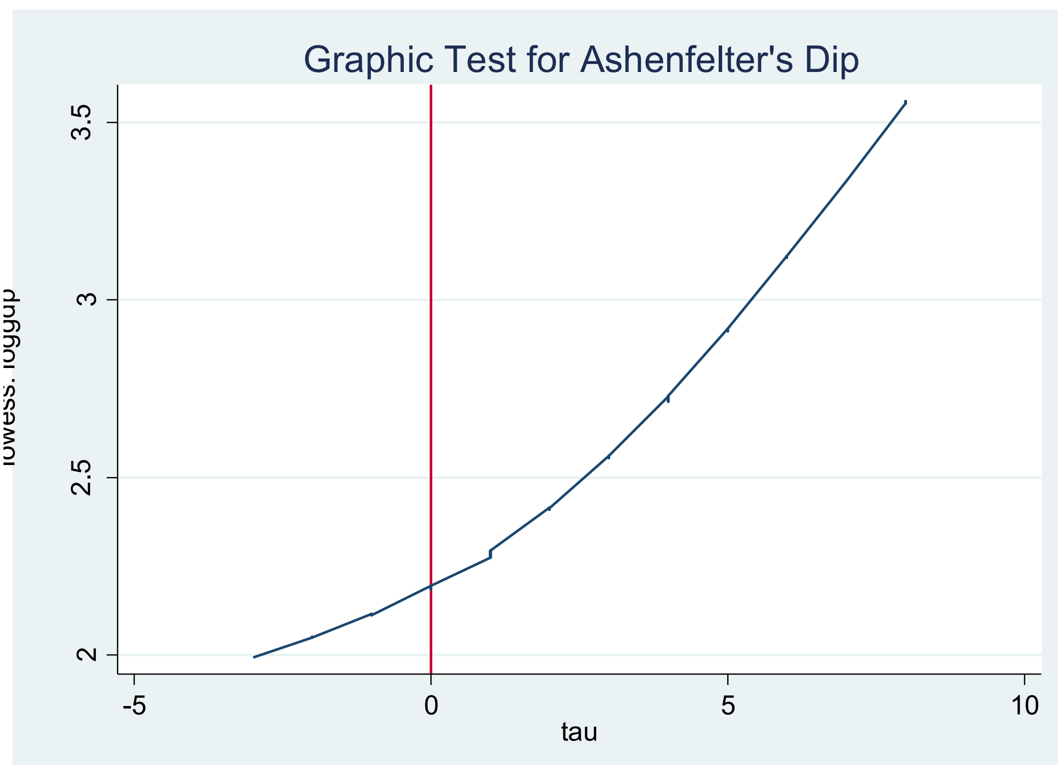
Table 11
Hausman Test on Log Difference in Government Expenditure & Revenue at District Level

Variable	Fixed Effects	Random Effects	Difference	SE
Western Development Strategy	1.560305	1.361046	0.1992586	0.0161874
Revitalize NE	1.393226	1.501302	-0.1080763	0.0100767
Rise Central China	1.523929	1.483526	0.0404027	0.0024996

chi2 = 116.02
Prob>chi2 = 0.0000

Table 12 Hausman Test on Log Difference in Government Expenditure & Revenue at Provincial Level				
Variable	**Fixed Effects**	**Random Effects**	**Difference**	**SE**
Western Development Strategy	1.540784	1.488034	0.0527502	0.0087004
Year End Population	0.0089571	0.0093268	-0.0003697	0.0000639
Percentage Rural Population	0.7156201	0.6579188	0.0576013	0.0044782
Area	0.0074775	0.0080889	-0.0006114	.
Revitalize NE	1.355639	1.407151	-0.0515122	0.0116844
Rise Central China	1.524558	1.511498	0.0130601	0.0038058
chi2 = 45.87 Prob>chi2 = 0.0000				

Figure 3: Graph Testing for Pre-Treatment Shocks



Notes, Table 13 (following)
Model 1 uses Provincial Fixed Effects on Nominal Differences in Government Revenue & Expenditure
Model 2 uses Provincial Fixed Effects with District-Level Controls
Model 3 uses Provincial Fixed Effects on Log Differences in Government Revenue & Expenditure
Model 4 uses Provincial Fixed Effects on Log Differences with District-Level Controls
Model 5 uses Two-Way Provincial Fixed Effects on Log Differences
Model 6 uses Two-Way Provincial Fixed Effects on Log Difference with District-Level Controls
Model 7 uses Clustered SE at the Provincial Level with Two-Way Provincial Fixed Effects on Log Differences with District-Level Controls
Model 8 uses Newey-West SE (1 period lag) with Two-Way Provincial Fixed Effects on Log Differences with District-Level Controls
Model 9 uses Clustered SE at the Provincial Level on data from Even Years 1998-2008
Model 10 uses Clustered SE at the Provincial Level on data from Odd Years 1997-2007
Model 11 uses Two-Way District Level Fixed Effects and Clustered SE at the Provincial Level
Model 12 uses District Level Fixed Effects and Clustered SE at the Provincial Level
Model 13 uses District-Level Fixed Effects with Newey-West SE (1 period lag)