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Research Article

An Empirical Analysis of the Impacts of Forestry Ecological Projects on Economic Development in Mountainous Area

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Abstract: The relationship between environmental protection and regional economic development is the main content that environmental policy debates. This issue is particularly prominent and important in the mountains. Forestry ecological project plays an important role in the promotion of environmental restoration in the mountain areas, but the contribution of mountain economy is still very vague. This study takes Xiangxi Tujia and Miao Autonomous Prefecture of Wuling Province as an example and establishes the fixed effect model (LSDV), which is drawn that forestry ecological construction on the overall effect of the regional national economy is positive, which increased afforestation area by 1%, Xiangxi's GNP by 3.7%, the first industrial production by 2.4%, secondary industry production by 4.2% and the third industry production by 4.9%. There is no doubt that economic forest than timber forest and public welfare forest contributes more to areas of national economy from the Tree species afforestation model.

Keywords: Forestry ecological project, fixed effects model, mountainous poverty reduction, xiang xiautonomous prefecture

INTRODUCTION

Since the 21st century, the relationship between environmental protection and regional economic development is the main content that environmental policy debates (Hunter and Toney, 2005; Ehrlich, 2001; Adams *et al*., 2004). Unfortunately, most environment weak regions are located in remote mountainous rural areas. Because environmental protection policies limit the resource utilization of the poor, the impact on local economic development is the most serious (Duan *et al*., 2010). The relationship between environmental degradation and poverty is called "poverty trap" that poverty leads to environmental degradation and environmental degradation is exacerbated by poverty (Zhang, 2004). This issue is particularly prominent and important in the mountains. Mountains carrying the dual mission of ecological protection and economic development, including mountain forests, desert, wetlands and other major terrestrial ecosystem are an important forest areas and water sources, which constitute the basis of ecological safety (Wu, 2007). In the meantime, the mountains also face the poverty and the plight of the urgent need of development, which has closed, fragility, marginal and borderline features (Zhu, 2006). Those have become an objective obstacle mountain out of poverty.

China is a mountainous country. Mountainous areas account for 69.3% of the land area and Mountainous population accounts for 56% of the total population of the country (Chen, 2008). China has 592 key counties for national poverty alleviation and development, 496 distributed in the mountains of rich forest resources (Liu *et al*., 2012). It is a common problem faced by many developing countries that how to build up the mountains based on economic growth, environmental protection and welfare improvement. Practice has proved that both environmental and economic win-win goal is commendable but it is difficult to achieve. In order to achieve the eradication of poverty and environmental restoration dual strategic goal, the Chinese government began to start the construction of six major forestry projects from the 1970s. As is known to all, forestry ecological projects in promoting mountainous environment recovery plays an important role. However, the contribution is vague to the economy in mountainous areas. Forestry ecological projects are not isolated, but closely linked with the social and economic development.

The study area is located in Wuling Mountain Area of Xiangxi Autonomous Prefecture (Fig. 1). The Xiangxi Autonomous Prefecture government treats the forestry projects as an important mission to enrich people and it has successively implemented a natural forest protection project and the Sloping land conversion project and other eight major ecological forestry construction projects, completed planting 49200 acres of key forestry projects. At the same time, because Xiangxi is a typical "old, small, frontier and poor" area, the economic development of Xiangxi and

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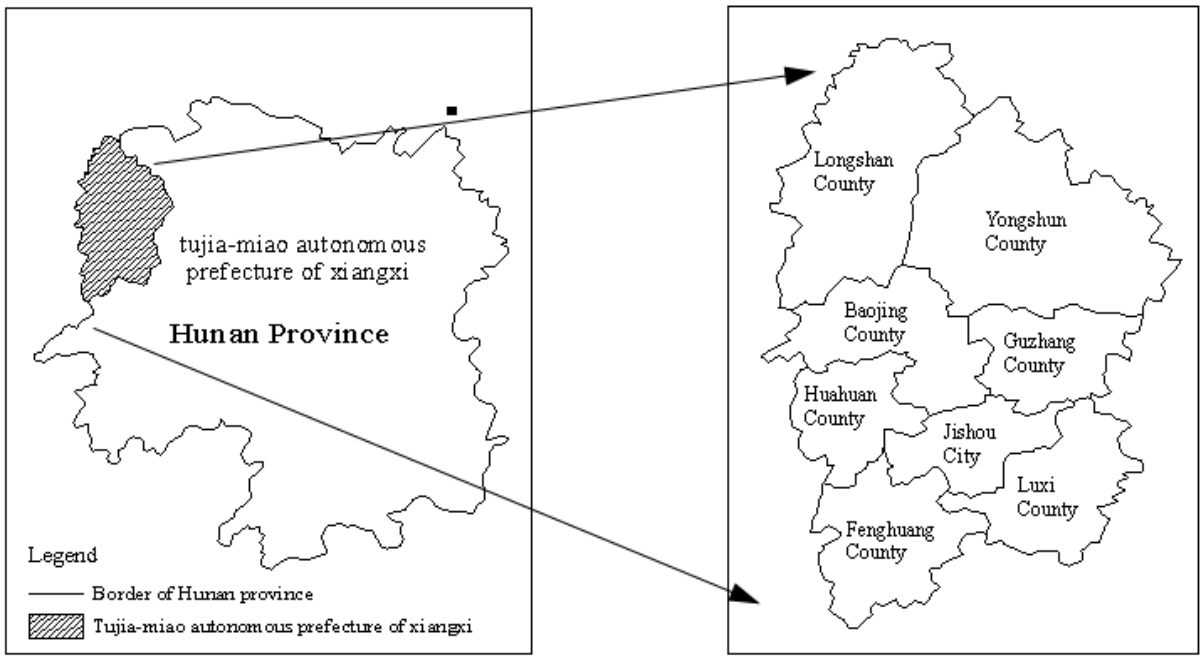

Fig. 1: Location of study area

poverty alleviation and reduction are also great stressful. This study takes Xiangxi Tujia and Miao Autonomous Prefecture as the research object, explores the contribution of forestry ecological environment construction in Wuling mountainous area on the mountain economy and provides policy recommendations for the healthy and harmonious development of Wuling mountainous area development and forestry construction.

MATERIALS AND METHODS

Data sources: The data this study used is mainly from "Xiangxi Statistical Yearbook", "rural Hunan Statistical Yearbook" and "Hunan Statistical Yearbook". The data using from 2005 to 2014, 10 years of Xiangxi Autonomous Prefecture of Hunan province, is a panel data of eight cities and counties including Jishou county, LuXi county, Fenghuang county, Huayuan county, Baojing county, Guzhang county, Yongshun County, Longshan County.

Descriptive statistics of the variables of this study are shown in Table 1.

Model: This study focuses on whether forestry construction has effects on areas of the national economy growth. The model 1 is the overall effect model of forestry ecological construction to the regional economic contribution, in order to investigate whether the construction of forestry makes the different effects on the different constituents of GNP. Type Y represents GNP, first industrial output, secondary industrial output and third industrial output. Model 1 is set as follows:

$$Ln(Y) = \alpha + lLn(Afforestration) + \varepsilon \quad (1)$$

Investment, the number of employees as well as the road three control variables, measures for forestry ecological projects effects on the economic contribution of the local area are added in model 2, the model is set as follows:

$$Ln(Y) = \alpha + \beta Ln(Investment) + gLn(Stuff) + qLn(Road) + lLn(Afforestration) + \varepsilon \quad (2)$$

In the above formula:

$\beta Ln(Investment)$ = The urban fixed-asset investment logarithmic function.

$gLn(Stuff)$ = The number of employees at the end of the logarithmic function.

$qLn(Road)$ = The length of road logarithmic function.

$lLn(Afforestration)$ = The afforestation of barren hills and wasteland area logarithmic function.

In order to determine whether different tree species of afforestation make different effects on the national economy, the model 3 is set as follows:

$$Ln(Y) = \alpha + \beta Ln(Investment) + gLn(Stuff) + qLn(Road) + mLn(Timber) + nLn(Economic) + rLn(Non-commertial) + \varepsilon \quad (3)$$

In the above formula:

$mLn(Timber)$ = The timber forest afforestation area of logarithmic function.

Table 1: Descriptive results of the sample

	Mean	S.D.	Min	Max
GNP (million yuan)	338404	171840	65395	863304
First industrial output (million yuan)	56444	29784	15426	126108
Secondary industrial output (million yuan)	137593	105792	15384	367092
Third industrial output (million yuan)	144368	107414	34585	511837
Fixed investment in urban and rural areas (million yuan)	150911	149939	23216	738856
Number of employees at the end of the year (millions)	21	7	9	33
The length of road (km.)	10903	847	9882	12259
Afforestation of barren hills and wasteland area(Ha)	1462	1268	0	4650
Including: Timber forest (Ha)	266	469	0	2020
Economic forest (Ha)	65	130	0	667
Non-commertial forest (Ha)	1091	1027	0	4650

Table 2: LSDV regression results of effect of afforestation to national economy of western Hunan province

	Total output value			First industrial output		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Fixed asset investment		0.047	0.002		0.041	0.030
		(0.073)	(0.071)		(0.038)	(0.039)
Number of employees at the		1.513	1.168		1.297*	1.213*
end of the year		(1.247)	(1.172)		(0.657)	(0.655)
The length of road		2.418***	2.699***		1.378***	1.464***
		(0.563)	(0.531)		(0.297)	(0.297)
Afforestation of barren hills	0.037*	-0.014		0.024*	-0.009*	
and wasteland area	(0.021)	(0.009)		(0.013)	(0.005)	
Including: Timber forest			-0.020**			-0.006
			(0.007)			(0.004)
Economic forest			0.001			-0.001
			(0.008)			(0.004)
Protection forest			-0.006			-0.007*
			(0.007)			(0.004)
Constant term	12.353***	-14.881***	-15.960***	10.655***	-6.317***	-6.728***
	(0.143)	(2.770)	(2.712)	(0.089)	(1.460)	(1.514)
R^2	0.000	0.467	0.485	0.078	0.871	0.871
	Secondary industrial output			Third industrial output		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Fixed asset investment		0.099	0.053		0.086	0.040
		(0.103)	(0.105)		(0.080)	(0.077)
Number of employees at the		-0.729	-1.066		3.192**	2.873**
end of the year		(1.771)	(1.754)		(1.368)	(1.283)
The length of road		3.327***	3.605***		2.003***	2.290***
		(0.800)	(0.795)		(0.618)	(0.581)
Afforestation of barren hills	0.042	-0.010		0.049**	-0.010	
and wasteland area	(0.025)	(0.013)		(0.024)	(0.010)	
Including: Timber forest			-0.020*			-0.021**
			(0.011)			(0.008)
Economic forest			0.002			0.001
			(0.011)			(0.008)
Protection forest			-0.001			-0.003
			(0.010)			(0.008)
Constant term	11.218***	-18.326***	-19.377***	11.352***	-17.485***	-18.650***
	(0.167)	(3.933)	(4.056)	(0.158)	(3.038)	(2.967)
R^2	0.012	0.022	0.005	0.005	0.348	0.344

Numbers in parentheses are standard errors. ***, **, and * denote significance at the 1, 5, and 10% levels, respectively

$nLn(Economic)$ = The economic forest afforestation area of logarithmic function.

$rLn(Non-commertial)$ = The non-commertial forest afforestation area of logarithmic function.

RESULTS AND DISCUSSION

Model regression results are shown in Table 2. It can be seen that the forestry projects make a certain contribution to gross national product value and composition of Xiangxi region (model1). Afforestation area increased by 1%.Xiangxi's GNP increased by 3.7%. The first industrial output increased by 2.4%. And secondary industry output increased by 4.2%. In the meantime, the third industry output increased by 4.9%. Therefore, in this study area, forestry ecological construction on the overall effect of the regional national economy is positive.

From the perspective of the local effect of forestry ecological construction in model 2, the forestry

ecological construction contributed to the national economy is not significant, even symbols into a negative when joined the control variable. Possible reasons are as follows. First of all, forestry area study is given priority to public welfare forest, even if timber forest also difficult to apply for the cutting index for mountain ecological protection. Therefore, afforestation activities are difficult to translate into direct productivity and economic benefits. This conclusion is also reflected in the peasant household questionnaire that farmer forestry income and production activities in the study area are very few. There is no doubt that the economic contribution from local forestry production is very small. Secondly, forest resources have a long growth cycle and many years into the characteristics of the harvest year so that the forestry harvest has time lag and dynamic. Because of it, there is a certain bias when made regression only by using the planting area and GNP that year. However, as the duration of the data collection is only for 5 years, lag-national economic variables are also unable to realize. We can infer that the estimated results from model are under partial. And forestry ecological construction of overall and local effects is greater than the estimate. In fact, the contribution rate of forestry ecological construction should be higher than the existing results and the coefficient should be positive. Thirdly, owing to the control variables joined in are too significant, it had a great influence on national economy gross domestic product and to a certain extent, it has also weakened the impact of afforestation on the national economy.

From the model 3 about the influence of species of afforestation activities on the national economy can be seen that, in addition to economic forest, timber forest and public welfare forest make no contribution to the national economy. Economic forest area increased by 1%. GNP increased by 0.1% and a 0.2% increase in total cost of the secondary industry, as well as the third industry output increased by 0.1%. Visibly, although the study area builds up the ecological protection purpose as well as has strict rules and constraints on public welfare forest and timber forest. Economic forest, however, are more likely to translate into tangible economic benefits and because of the short growth period, those contribute more to the regional national economy.

CONCLUSION

This study, with the data of 8 counties in Xiangxi from 2005 to 2014 ten years, by constructing panel data fixed effects model, obtained by LSDV estimation methods: forestry ecological construction on the overall effect of the regional economy is positive, of which forest area increased by 1% and Xiangxi area's GNP increased by 3.7%. First industrial output increased by 2.4%. In the meantime, secondary industrial output increased by 4.2% and the third industry output increased by 4.9%. However, when added to other control variables, local effects of forestry ecological construction will no longer contribute to the national economy significantly and even become a negative symbol. The reasons include local restrictions on harvesting forest resources, model estimation bias owing to the long growth cycle of the forest and other significant variables. From the Tree species afforestation model, there is no doubt that economic forest than timber forest and public welfare forest contributes more to areas of national economy.

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