ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue X October 2024

Do Economic Growth and Education Matter in Combating Human Trafficking? An Analysis of State Level Panel Data in the U.S.

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DOI: https://doi.org/10.51244/IJRSI.2024.1110003

Received: 20 September 2024; Accepted: 30 September 2024; Published: 28 October 2024

ABSTRACT

Human trafficking, consisting of all forms of nonconsensual forced or lured labor, is a violation of human rights and has severe impacts on the affected individuals, families, and society. In this paper, we investigate the factors of economic development, educational attainment, and states that potentially influence human trafficking in the U.S. Using panel data of human trafficking reports from all fifty states and D.C. from 2016 to 2021, we obtain interesting results. First, economic development has a small but significant negative effect on human trafficking within states, implying that economic development helps to reduce human trafficking, although richer states have slightly more cases. Second, it is surprising that high school graduation rates have a positive rather than negative effect, implying that education correlates with more identified trafficking cases. A possible explanation is that education increases the population's awareness of trafficking activities, leading to higher reporting rates. Last, some states reveal significant effects, indicating geographical differences in the country. These findings have important policy and social implications.

Keywords: Human trafficking, economic development, education, states, public health

INTRODUCTION

Human trafficking, consisting of all forms of nonconsensual forced or lured labor, is an important social and economic issue (Koettl, 2009). In the U.S., the Trafficking Victims Protection Act (TVPA) defines trafficking in persons as "(a) sex trafficking in which a commercial sex act is induced by force, fraud, or coercion, or in which the person induced to perform such act has not attained 18 years of age; or (b) the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery." Internationally, the United Nations (UN) defines human trafficking as the recruitment, transportation, transfer, harboring, or receipt of a person for the purpose of exploitation through the use of force, fraud, or deception.

Much of the social study literature has focused on the impacts on victims and the mental, social, and financial means to help them (e.g., Polizzi et al., 2024). In the economics literature, Wheaton et al. (2010) use a rational-choice framework to understand the market of human trafficking. However, to our knowledge, there has been limited work on how important economic factors such as economic development, literacy, and

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue X October 2024

geography affect the trafficking of human beings. This motivates us to identify the relevant factors and their effects. In this paper, panel data is collected on reported human trafficking cases, GDP per capita, high school graduation rate, and the percentage of college degree holders in the population from fifty states and the District of Columbia (D.C.) over the period from 2016 to 2021, and subsequently statistical test is performed using both fixed- and random-effect models are used to identify the relationships.

The remainder of this paper is organized as follows. A literature review is conducted in the next section. The section on Methodology details the model structure, hypotheses, and test results. Then, the Discussion section explores the possible implications of the statistical results. The last section concludes the paper.

LITERATURE REVIEW

Lack of development oftentimes is regarded as the root cause of human trafficking. However, Danailova-Trainor and Laczko (2010) mention that there is some evidence to suggest that victims of cross-border trafficking are more likely to originate from middle-income rather than lower-income countries. In the context of the U.S., whether there exists a concrete relationship between income level and trafficking and whether there exists geographical differences among the states remains unanswered.

Governments play a leading role in fighting human trafficking, but their ability is constrained by available resources, existing laws, and prevailing social norms. Danailova-Trainor and Laczko (2010) emphasize that different levels of government need to coordinate to increase the effectiveness of helping trafficking victims in personal development.

On the effect of education on trafficking, Spires (2015) studies two NGOs' educational work and other measures to prevent human trafficking and protect youth in Thailand. Numerous other studies looked at the usefulness of educating health professionals on treating trafficking victims (e.g., Nordstrom, 2022; Miller et al., 2022). Much less of the literature has looked at how the education of the general public affects human trafficking, although it is generally believed that education increases the awareness of trafficking and helps lower the vulnerability of the at-risk population (Lesak et al., 2021). Some studies pointed out that the study of trafficking faces the problem of data accuracy, and the increased awareness of trafficking through education and policy efforts can transform the unreported hidden cases into documented reports (Brunovskis and Surtees, 2010; Van Dijk, 2024; Zhang, 2022). Therefore, education may be able to reduce trafficking but increase reports.

The exploitation of humans also exhibits geographical differences. Lo (2024) finds that organized crime and corruption impede the effectiveness of law on Hong Kong's trafficking increases. Phon and Price (2024) find that climate change and disaster crises cause human migration and trafficking activities in Cambodia. Denton (2016) investigates who the traffickers and victims are in the U.S. using legal cases from 2006 to 2011 and found that the traffickers and victims are likely from the same community.

As pointed out by Goździak (2008), little research has been done on whether and how economic development affects human trafficking, whether education can build a firewall to prevent trafficking, and whether the states exhibit geographical differences in the U.S. In this paper, we try to answer these questions through an empirical study using state-level panel data from 2016 to 2021in the U.S. The findings draw a much clearer picture of the relationships between trafficking activities and these important factors and provide important policy implications.

METHODOLOGY

Empirical Model

Based on the previous analysis, we hypothesize the model as follows:

$$y_{s,t} = a + GDP_{s,t} + H_{s,t} + C_{s,t} + S_t$$

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue X October 2024

The reported trafficking cases are the dependent variable ($y_{s,t}$) where subscript *s* represents the state factor and *t* represents the time factor. Symbol α is the intercept. $GDP_{s,t}$ is the state GDP per capita, which is used to present the economic development level and speed over the five years. We use two series of data to represent education level. $H_{s,t}$ is the state high school graduation rate, and $C_{s,t}$ is the state college degree attainment rate. S_t captures the state factor.

The conventional thinking is that economic development brings economic opportunities and increases personal wealth, so it can reduce the population vulnerable to trafficking. Hence, we hypothesize the following relationship:

H1: GDP per capita is negatively correlated with human trafficking reports.

It is also commonly believed that education can increase the population's awareness of and resistance to human trafficking, so we hypothesize the following relationships:

H2: High school graduation rate is negatively correlated with human trafficking reports.

H3: College degree attainment rate is negatively correlated with human trafficking reports.

Due to the legal, social, economic, geographical, and cultural differences among the states, we believe there exists regional differences across the states regarding human trafficking situations. Hence we have the following hypothesis:

H4: There are regional differences across the states in human trafficking.

Data Description

The number of identified human trafficking cases is extracted from the National Human Trafficking Hotline (NHTH).[1] We divide the total reported cases by the respective state population and then multiply by 100,000 to receive the reported cases per 100,000 people in order to eliminate the size effect. We obtain the most recent five years of data from 2016 to 2021 due to data availability and consistency.

GDP per capita is used to represent the state of the economy for the same periods. The values capture the information of both the economic development within the states and the different development levels between the states.

The state-level high school graduation rates and the college degree attainment rates are obtained from the U.S. Department of Education.[2][3]

The fifty states and D.C. are treated as categorical variables in the panel data. Both the fixed- and random-effect models are performed to investigate whether there are significant differences within and across the states.

The panel data is summarized in Table 1.

[1] https://humantraffickinghotline.org/en

[2] https://nces.ed.gov/programs/coe/indicator/coi/high-school-graduation-rates

[3] https://nces.ed.gov/programs/coe/indicator/ctr/undergrad-retention-graduation

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue X October 2024

Table 1: Panel Data Summary

	2021				2020				2019				2018				2017				2016			
State	GDP	High Sch	College	Cases	GDP	High Sch	College	Cases	GDP	High Sch	College	Cases	GDP	High Sch	College	Cases	GDP	High Sch	College	Cases	GDP	High Sch	College	Cases
Alabama	52,179	87.9%	27.4%	1.584	48,035	86.9%	26.2%	1.732	46,658	87.1%	26.3%	1.711	44,941	86.6%	25.5%	1.856	43,232	86.5%	25.5%	1.436	42,196	85.1%	24.7%	0.987
Alaska	80,047	93.3%	32.8%	2.177	73,238	93.1%	30.0%	3.000	73,810	93.6%	30.2%	2.050	72,347	93.3%	30.2%	2.576	71,547	91.7%	28.8%	1.217	75,756	93.1%	29.6%	1.484
Arizona	57,155	89.0%	32.4%	2.984	51,280	87.9%	30.3%	0.000	49,954	87.6%	30.2%	0.000	48,492	87.5%	29.7%	3.235	47,121	87.2%	29.4%	2.637	45,748	86.7%	28.9%	2.179
Arkansas	49,599	88.7%	25.3%	2.443	47,383	87.2%	23.8%	6.409	46,002	87.5%	23.3%	7.655	44,823	87.2%	23.3%	2.754	43,789	86.7%	23.4%	1.518	42,230	86.0%	22.4%	1.606
California	88,690	84.4%	36.2%	3.408	76,935	83.9%	34.7%	0.253	76,678	84.0%	35.0%	0.218	73,153	83.8%	34.2%	4.174	70,184	83.3%	33.6%	3.382	67,390	82.4%	32.9%	3.452
Colorado	74,810	92.4%	44.4%	2.581	67,862	92.1%	41.6%	23.139	66,971	92.4%	42.7%	26.360	64,975	91.9%	41.7%	3.149	63,574	91.6%	41.2%	2.158	62,119	91.4%	39.9%	2.328
Connecticut	86,880	91.1%	42.1%	1.498	78,900	90.9%	40.0%	3.827	79,434	90.7%	39.8%	5.089	77,279	90.9%	39.6%	1.572	76,559	90.4%	38.7%	1.706	72,706	90.5%	38.6%	1.533
Delaware	85,027	91.4%	35.6%	3.085	74,779	90.6%	31.0%	4.950	73,516	90.3%	30.2%	5.545	70,792	89.8%	31.3%	4.005	68,102	90.6%	31.5%	2.495	64,984	89.3%	31.0%	2.206
DC	219,080	89.8%	33.2%	6.577	200,277	88.5%	30.5%	3.916	200,418	88.4%	30.7%	5.243	187,076	88.5%	30.4%	12.243	179,569	88.4%	29.7%	10.087	169,814	87.4%	28.6%	12.479
Florida	58,606	89.0%	34.6%	3.578	55,292	87.9%	32.2%	0.190	53,592	87.9%	32.5%	0.363	51,541	87.6%	31.9%	3.575	49,637	87.0%	30.9%	2.969	47,772	86.4%	30.5%	2.727
Georgia	65,923	92.9%	35.3%	2.604	54,706	92.5%	33.6%	6.954	53,891	92.4%	33.6%	8.458	52,046	92.0%	33.5%	3.577	50,171	92.3%	32.9%	2.777	47,237	92.0%	31.9%	2.522
Hawaii	67,502	91.3%	30.7%	2.074	51,412	91.3%	28.7%	2.749	54,302	91.5%	28.7%	0.353	52,325	90.9%	27.7%	3.308	50,222	90.8%	26.8%	1.961	49,045	90.4%	27.6%	2.170
Idaho	52,929	90.2%	37.1%	1.733	51,386	89.7%	35.5%	1.577	49,992	89.8%	35.8%	1.959	48,256	89.5%	35.1%	1.482	46,947	89.1%	34.4%	0.757	44,524	88.8%	34.0%	0.891
Illinois	77,449	90.6%	28.9%	1.915	63,835	89.3%	27.2%	1.959	63,026	89.6%	26.9%	0.213	61,536	89.0%	27.1%	2.328	59,898	88.6%	26.8%	1.601	58,321	88.4%	25.6%	1.640
Indiana	64,359	93.3%	30.5%	1.805	56,184	92.5%	29.3%	2.063	54,463	92.6%	29.3%	3.996	53,264	92.3%	29.0%	2.122	52,305	92.1%	28.9%	1.459	50,592	91.8%	28.4%	1.297
Iowa	70,468	91.9%	35.4%	2.689	58,619	91.4%	33.9%	2.445	57,452	91.8%	34.0%	4.944	55,864	91.0%	33.8%	3.240	54,873	91.0%	33.7%	2.480	52,925	90.5%	32.8%	2.358
Kansas	67,972	88.0%	27.0%	2.893	56,117	87.2%	25.0%	2.961	54,300	87.2%	25.1%	3.402	52,919	86.8%	24.8%	3.229	51,436	86.3%	24.0%	2.402	49,217	85.7%	23.4%	1.889
Kentucky	54,571	86.7%	26.4%	2.551	49,678	85.9%	24.9%	2.241	48,279	86.0%	25.0%	2.100	47,126	85.8%	24.3%	3.205	45,703	85.1%	23.8%	1.843	43,698	84.4%	23.4%	1.983
Louisiana	57,731	94.5%	36.0%	2.723	60,858	93.2%	32.5%	2.211	58,701	93.2%	33.2%	2.969	57,172	93.0%	31.5%	3.183	55,726	92.3%	32.1%	2.414	54,087	92.3%	30.1%	2.414
Maine	58,453	91.1%	42.5%	2.248	50,725	90.6%	40.9%	1.981	49,170	90.4%	40.9%	11.680	47,906	90.5%	40.8%	2.615	46,238	89.9%	39.7%	1.422	45,671	90.1%	39.3%	1.351
Maryland	73,245	91.1%	46.6%	1.911	70,485	91.1%	44.5%	2.185	69,586	91.3%	45.0%	0.579	67,733	90.8%	44.5%	2.830	65,695	90.8%	43.4%	2.024	64,602	90.4%	42.7%	2.759
Massachusetts	96,025	92.0%	31.7%	1.330	85,279	91.3%	30.0%	1.166	84,627	91.4%	30.0%	2.728	82,474	91.1%	29.6%	1.691	80,015	90.9%	29.1%	1.450	76,301	90.4%	28.3%	1.321
Michigan	59,279	94.1%	38.9%	2.939	56,194	93.4%	36.8%	2.878	54,638	93.6%	37.3%	1.061	53,013	93.4%	36.7%	3.846	51,567	93.1%	36.1%	3.152	49,844	92.9%	34.8%	2.556
Minnesota	75,247	86.5%	24.8%	1.714	65,157	85.3%	22.8%	1.542	64,101	85.3%	22.3%	6.401	62,410	85.4%	23.2%	2.194	60,923	84.4%	21.9%	1.402	58,499	84.1%	21.8%	1.250
Mississippi	43,815	91.6%	31.7%	7.899	40,511	90.6%	29.9%	6.247	39,407	90.7%	30.2%	3.572	38,618	90.5%	29.5%	2.923	37,585	89.7%	29.1%	1.407	36,090	89.6%	28.5%	1.842
Missouri	60,480	94.4%	34.8%	3.890	54,194	94.0%	33.1%	4.371	53,362	94.2%	33.6%	2.388	51,392	93.9%	31.7%	2.908	50,084	93.0%	32.3%	2.408	47,287	92.8%	31.0%	2.314
Montana	57,126	92.2%	34.4%	2.169	51,392	91.6%	32.5%	2.859	49,876	92.0%	33.2%	21.801	48,417	91.4%	32.4%	1.980	47,292	91.3%	31.7%	2.590	46,316	90.9%	32.4%	1.544
Nebraska	78,969	87.2%	27.6%	2.902	63,661	86.9%	25.5%	3.670	63,313	86.9%	25.7%	1.964	61,524	86.9%	24.9%	4.198	60,059	86.8%	24.9%	3.597	57,478	86.0%	23.5%	2.464
Nevada	64,130	94.5%	36.0%	6.388	56,092	93.2%	32.5%	6.152	54,557	93.2%	33.2%	2.007	51,641	93.0%	31.5%	10.082	49,008	92.3%	32.1%	7.071	47,046	92.3%	30.1%	5.952
New Hampshire	74,652	91.0%	43.1%	1.730	68,775	90.3%	40.7%	1.234	68,601	90.3%	41.2%	17.577	65,458	90.2%	40.8%	0.887	62,311	89.9%	39.7%	0.372	58,895	89.3%	38.6%	0.974
New Jersey	78,890	87.5%	30.1%	1.629	70,536	86.5%	28.1%	1.572	69,651	85.9%	27.7%	0.169	66,692	85.4%	27.7%	2.481	64,095	86.1%	27.1%	1.891	60,846	85.4%	27.2%	2.210
New Mexico	54,479	88.0%	39.9%	2.787	50,398	87.2%	37.5%	2.503	48,486	87.6%	37.8%	11.780	47,042	87.1%	37.2%	3.341	45,377	86.6%	36.0%	1.907	44,538	86.3%	35.7%	1.911
New York	99,181	89.7%	34.9%	2.035	79,379	88.5%	32.0%	2.064	78,277	88.6%	32.3%	0.330	75,580	88.2%	31.9%	2.526	72,838	87.8%	31.3%	1.756	69,779	87.3%	30.4%	1.692
North Carolina	63,975	93.6%	31.7%	2.110	51,912	93.1%	30.7%	2.500	50,158	93.5%	30.4%	4.367	48,579	92.3%	29.7%	2.754	47,042	92.9%	30.7%	2.278	46,267	92.4%	29.6%	1.853
North Dakota	86,194	91.7%	30.7%	2.442	74,185	90.8%	28.9%	2.695	76,236	90.8%	29.3%	35.168	73,922	90.7%	29.0%	1.842	72,120	90.3%	28.0%	3.177	69,024	90.0%	27.5%	2.507
Ohio	65,303	88.7%	27.9%	2.473	56,100	88.6%	26.1%	2.636	55,295	88.4%	26.2%	3.833	53,560	88.4%	25.6%	3.815	51,636	88.1%	25.5%	3.277	49,348	87.8%	25.2%	3.255
Oklahoma	54,771	91.9%	36.3%	2.480	55,474	91.1%	34.4%	2.829	54,826	91.4%	34.5%	2.805	52,299	90.5%	34.0%	3.096	50,918	91.0%	33.7%	2.090	46,481	90.3%	32.7%	2.352
Oregon	65,142	91.9%	34.5%	3.759	63,934	91.0%	32.3%	3.280	62,469	91.0%	32.3%	3.159	60,006	91.0%	31.8%	3.221	57,657	90.6%	31.4%	2.052	53,804	90.1%	30.8%	1.930
Pennsylvania	68,328	89.1%	36.5%	1.475	63,303	89.2%	35.0%	1.692	62,283	89.3%	34.8%	2.125	59,401	89.1%	34.4%	2.116	57,436	88.3%	33.5%	1.664	54,267	88.5%	34.1%	1.259
Rhode Island	64,835	89.6%	31.5%	1.458	59,613	88.3%	29.0%	0.911	57,118	88.3%	29.6%	1.420	55,240	88.4%	28.3%	1.795	53,826	87.4%	28.0%	1.038	50,266	86.6%	27.2%	0.759
South Carolina	53,384	93.1%	31.7%	2.387	48,585	92.2%	29.3%	2.423	47,718	92.1%	29.7%	2.680	45,949	92.3%	29.2%	3.029	44,827	91.7%	28.1%	2.388	42,206	91.2%	28.9%	1.610
South Dakota	70,053	89.7%	30.5%	3.236	60,558	88.2%	28.2%	2.707	59,778	88.0%	28.7%	2.939	58,426	87.8%	27.5%	2.506	57,106	87.8%	27.3%	2.069	54,696	87.0%	26.1%	2.195
Tennessee	63,224	85.4%	33.1%	2.183	54,318	84.4%	30.7%	2.359	52,323	84.6%	30.8%	2.628	50,625	84.0%	30.3%	2.475	48,694	83.6%	29.6%	1.697	45,624	82.9%	28.9%	1.639
Texas	70,789	93.2%	36.8%	3.102	62,998	93.0%	34.7%	3.407	64,377	93.0%	34.8%	3.744	63,006	92.4%	34.9%	3.487	61,704	92.1%	34.6%	2.883	59,458	91.7%	32.6%	2.444
Utah	69,573	94.5%	44.4%	2.336	60,447	93.5%	39.7%	1.987	56,190	93.1%	38.7%	2.807	53,976	93.5%	38.7%	2.347	52,192	92.6%	38.3%	1.128	50,338	92.1%	36.4%	1.376
Vermont	60,399	91.4%	41.8%	2.164	55,498	90.3%	39.5%	2.022	54,338	90.0%	39.6%	1.442	52,410	89.9%	39.3%	2.236	50,527	89.7%	38.7%	2.245	48,291	89.3%	38.1%	0.962
Virginia	71,449	92.3%	39.0%	1.617	67,731	91.7%	36.7%	1.390	67,097	91.7%	37.0%	2.203	64,880	91.6%	36.7%	2.336	62,768	91.3%	35.5%	1.901	59,327	90.8%	35.1%	1.855
Washington	89,361	88.8%	24.1%	3.010	76,500	87.6%	21.3%	3.102	74,875	87.1%	21.1%	3.533	72,191	87.8%	21.3%	3.017	69,936	87.1%	20.2%	2.296	67,058	86.0%	20.8%	2.333
West Virginia	52,013	93.3%	32.5%	2.185	44,517	92.6%	30.8%	2.230	44,414	92.8%	31.3%	2.120	43,862	92.1%	30.0%	2.160	42,399	92.4%	30.4%	0.881	41,324	91.9%	29.5%	1.147
Wisconsin	64,914	93.6%	29.2%	1.616	58,390	93.6%	28.2%	1.663	57,671	94.5%	29.1%	1.645	55,138	93.3%	26.9%	2.336	53,899	92.9%	27.6%	1.636	51,796	93.2%	27.1%	1.142
Wyoming	76,277	93.6%	29.2%	2.243	73,242	93.6%	28.2%	1.907	68,553	94.5%	29.1%	2.073	68,720	93.3%	26.9%	2.073	67,513	92.9%	27.6%	2.250	65,634	93.2%	27.1%	2.391

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue X October 2024

Statistical Results

We performed OLS regressions on the panel data with both the fixed-effect model and the random-effect model to better identify the correlations within and between states. The fixed effects model test results are in Tables 2 and 3.

Table 2: Fixed Effects Model Regression Summary

Dep.Variable:	human trafficking	R-squared:	0.291
Model:	OLS	Adj.R-squared:	0.141
Method:	Least Squares	F-statistic:	1.947
No.Observations:	306	Prob (F-statistic):	0.000364
Df Residuals:	252	Log-Likelihood:	-756.86
Df Residuals:	53	AIC:	1622
Covariance Type:	nonrobust	BIC:	1823

Table 3: Fixed Effects Model Regression Results

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-104.2392	45.489	-2.292	0.023	-193.827	-14.651
C(State)[T.Alaska]	-4.0988	3.226	-1.27	0.205	-10.453	2.255
C(State)[T.Arizona]	-0.8569	2.097	-0.409	0.683	-4.987	3.273
C(State)[T.Arkansas]	1.6702	2.087	0.8	0.424	-2.439	5.78
C(State)[T.California]	7.8523	4.515	1.739	0.083	-1.039	16.744
C(State)[T.Colorado]	2.8653	3.884	0.738	0.461	-4.785	10.515
C(State)[T.Connecticut]	-1.1972	3.128	-0.383	0.702	-7.357	4.962
C(State)[T.DC]	23.8211	8.604	2.769	0.006	6.877	40.765
C(State)[T.Delaware]	0.5499	2.136	0.257	0.797	-3.657	4.757
C(State)[T.Florida]	-0.2659	2.415	-0.11	0.912	-5.023	4.491
C(State)[T.Georgia]	-3.9387	3.019	-1.305	0.193	-9.884	2.006
C(State)[T.Hawaii]	-4.1181	2.705	-1.522	0.129	-9.445	1.209
C(State)[T.Idaho]	-4.3063	3.064	-1.405	0.161	-10.342	1.729

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C(State)[T.Illinois]	-0.9019	2.271	-0.397	0.692	-5.374	3.57
C(State)[T.Indiana]	-5.8092	3.218	-1.805	0.072	-12.148	0.529
C(State)[T.Iowa]	-3.4876	2.608	-1.337	0.182	-8.624	1.648
C(State)[T.Kansas]	2.3477	2.016	1.164	0.245	-1.623	6.319
C(State)[T.Kentucky]	2.4708	1.922	1.286	0.2	-1.314	6.256
C(State)[T.Louisiana]	-6.1468	3.194	-1.925	0.055	-12.436	0.143
C(State)[T.Maine]	-3.7679	4.377	-0.861	0.39	-12.388	4.853
C(State)[T.Maryland]	-3.7257	4.672	-0.797	0.426	-12.927	5.476
C(State)[T.Massachusetts]	-0.9063	2.775	-0.327	0.744	-6.371	4.558
C(State)[T.Michigan]	-7.3517	3.582	-2.052	0.041	-14.407	-0.297
C(State)[T.Minnesota]	5.5453	2.707	2.049	0.042	0.215	10.876
C(State)[T.Mississippi]	-3.6413	2.793	-1.304	0.193	-9.141	1.859
C(State)[T.Missouri]	-7.1862	3.592	-2.001	0.046	-14.26	-0.113
C(State)[T.Montana]	-2.3988	2.876	-0.834	0.405	-8.063	3.265
C(State)[T.Nebraska]	3.9311	2.225	1.767	0.078	-0.451	8.313
C(State)[T.Nevada]	-3.0123	3.297	-0.914	0.362	-9.505	3.48
C(State)[T.New Hampshire]	-0.9313	3.783	-0.246	0.806	-8.381	6.519
C(State)[T.New Jersey]	3.5849	2.321	1.544	0.124	-0.986	8.156
C(State)[T.New Mexico]	1.0483	4.107	0.255	0.799	-7.04	9.137
C(State)[T.New York]	1.8824	2.267	0.83	0.407	-2.583	6.348
C(State)[T.North Carolina]	-6.6087	3.421	-1.932	0.055	-13.346	0.129
C(State)[T.North Dakota]	4.9409	2.591	1.907	0.058	-0.162	10.043
C(State)[T.Ohio]	0.7775	2.07	0.376	0.707	-3.299	4.854
C(State)[T.Oklahoma]	-4.4388	2.81	-1.58	0.115	-9.973	1.096
C(State)[T.Oregon]	-2.727	2.367	-1.152	0.25	-7.388	1.934
C(State)[T.Pennsylvania]	-1.5745	2.6	-0.606	0.545	-6.694	3.545
C(State)[T.RhodeIsland]	-0.9866	1.883	-0.524	0.601	-4.694	2.721
C(State)[T.South Carolina]	-6.2055	3.205	-1.936	0.054	-12.517	0.106

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C(State)[T.South Dakota]	0.9449	1.904	0.496	0.62	-2.804	4.694
C(State)[T.Tennessee]	4.1783	3.258	1.282	0.201	-2.238	10.595
C(State)[T.Texas]	-4.3369	2.836	-1.529	0.127	-9.923	1.249
C(State)[T.Utah]	-7.6987	3.777	-2.038	0.043	-15.138	-0.26
C(State)[T.Vermont]	-4.4086	3.92	-1.125	0.262	-12.13	3.312
C(State)[T.Virginia]	-4.3219	2.782	-1.553	0.122	-9.801	1.157
C(State)[T.Washington]	4.7536	3.57	1.332	0.184	-2.277	11.784
C(State)[T.West Virginia]	-7.8099	3.39	-2.304	0.022	-14.487	-1.133
C(State)[T.Wisconsin]	-7.264	3.925	-1.851	0.065	-14.995	0.467
C(State)[T.Wyoming]	-5.0288	3.895	-1.291	0.198	-12.699	2.642
GDP per capita	-0.0001	6.45E-05	-2.086	0.038	0	-7.50E-06
High School Graduation Rate	126.1617	58.932	2.141	0.033	10.1	242.224
College Degree Attainment Rate	10.1992	34.226	0.298	0.766	-57.207	77.606
Omnibus:	319.535	Durbin-Watson:	2.173			
Prob(Omnibus):	0	Jarque-Bera(JB):	15405.93			
Skew:	4.302	Prob(JB):	0			
Kurtosis:	36.679	Cond.No.	28300000			

Model Fit

The R-squared value is 0.291, indicating that approximately 29.1% of the variation in human trafficking rates is explained by the model. The p-value for F-statistic is 0.000364, indicating that the model is statistically significant overall.

Significant Factors

GDP per capita: The coefficient is -0.0001 with a p-value of 0.038. This suggests that an increase in GDP per capita is associated with a slight decrease in human trafficking rates within states. The p-value indicates that the small negative effect is significant. This finding is consistent with our expectation and H1 fails to be rejected.

High school graduation rate: The coefficient is 126.1617 with a p-value of 0.033. This indicates that higher high school graduation rates are statistically significantly associated with an increase in human trafficking rates within states. This finding seems to contradict the common belief that education helps to prevent the exploitation of trafficking. H2 is rejected.

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College degree attainment rate: The coefficient is 10.1992 with a p-value of 0.766. This factor is not statistically significant. H3 is rejected.

State: Certain states have significant coefficients. Specifically, California has a coefficient of 7.8523 with a p-value of 0.083, which is borderline significant; the District of Columbia (DC) has a coefficient of 23.8211 with a p-value of 0.006; Utah has a coefficient of -7.6987 with a p-value of 0.043; and West Virginia has a coefficient of -7.8099 with a p-value of 0.022. This indicates that the state factor indeed affects human trafficking rates, so H4 fails to be rejected.

Table 4: Random Effects Regression Summary

Dep. Variable:	Human trafficking	R-squared:	0.0346
Estimator:	Random Effects	R-squared (Between):	0.1937
No. Observations:	306	R-squared (Within):	-0.0012
Date:	Mon, Sep 09 2024	R-squared (Overall):	0.0509
Time:	11:57:08	Log-likelihood	-787.48
Cov. Estimator:	Unadjusted		
		F-statistic:	3.6118
Entities:	51	P-value	0.0137
Avg Obs:	6.0000	Distribution:	F(3,302)
Min Obs:	6.0000		
Max Obs:	6.0000	F-statistic (robust):	3.6118
		P-value	0.0137
Time periods:	6	Distribution:	F(3,302)
Avg Obs:	51.000		
Min Obs:	51.000		
Max Obs:	51.000		

Table 5: Random Effects Parameter Estimates

	Parameter	Std. Err.	T-stat	P-value	Lower CI	Upper CI
GDP per capita	2.93E-05	1.05E-05	2.7837	0.0057	8.59E-06	5.00E-05
High School Graduation Rate	9.7872	9.2844	1.0541	0.2927	-8.4832	28.057
College degree attainment	3.3736	4.8087	0.7016	0.4835	-6.0892	12.836

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rate						
intercept	-8.6758	7.8826	-1.1006	0.2719	-24.188	6.836

The random effects model is better at explaining the differences between states. The R-square between states has a value of 0.1937, indicating that about 19.37% of the changes are explained by the model. The coefficient of GDP per capita is 2.93 E-05 with a p-value of 0.0057, indicating that the small coefficient is positive and statistically significant. The education variables have positive but insignificant coefficients, indicating that they do not have a clear relationship with human trafficking.

DISCUSSION

First of all, the fixed effects model results indicate that the growth of GDP per capita within the states helps to reduce trafficking, although the effect is small but significant. Several reasons can explain this encouraging relationship. Firstly, as GDP per capita increases, the typical standard of living in the region increases. This can reduce the vulnerability of individuals to human trafficking due to lower poverty, and improved access to resources. Secondly, a higher GDP per capita often correlates with lower unemployment rates and better job opportunities. When people have more access to legitimate employment, they are less likely to fall prey to traffickers who exploit economic desperation. Thirdly, the higher GDP per capita may also mean more social support systems and stronger law enforcement to protect individuals from becoming victims of trafficking. However, the random effects model results show that, across states, higher GDP per capita is associated with higher human trafficking rates. A possible explanation can be that the richer states have more resources to help victims reach out to authorities. This contrast suggests different dynamics at play within and between states.

Second, it is to our surprise that high school graduation rate has a statistically positive effect on trafficking. This seems counterintuitive because, with a higher level of education, people are more aware of the vulnerability of trafficking and can better protect themselves. Several possible explanations could account for this finding. The states with higher education levels may have better awareness and recognition of human trafficking which leads to higher reported rates. States with higher high school graduation rates may be more urbanized, and urban areas can have higher trafficking rates due to the higher density of population and higher chances of exploitation. It can also be that states with higher high school graduation rates have better law enforcement to better identify trafficking cases and better social support systems that motivate victims to step forward. If these are truly the reasons for the positive relationship between education and trafficking cases, then education plays an important role in converting the hidden cases into identified ones.

Third, the test shows that the college degree attainment rate is statistically insignificant. This might be because: 1. College graduates are more socially and economically established and less vulnerable to trafficking; 2. It represents a smaller segment of the population than high school graduates so it may not directly influence the factors that make individuals vulnerable to trafficking; 3. It may overlap other factors such as high school graduation rate and GDP per capita in explaining trafficking.

Fourth, certain states have significant coefficients, indicating that the state factor affects human trafficking rates. Specifically, California has a marginal significant and positive coefficient, the District of Columbia has a significant and positive coefficient, and Utah and West Virginia have significant and negative coefficients. This finding indicates that human trafficking is a complex mix of local conditions such as economic development, geographics, legal and social environments, policy, etc. States with lower income and higher poverty may have more vulnerable populations to human trafficking, while states with higher income may have more resources to combat trafficking but may also attract traffickers due to more economic activities and wealth. States with major transportation hubs might be more significant in trafficking networks, both for moving victims and for exploiting them within the state. This could partly explain why California and DC have positive coefficients and Utah and West Virginia have negative coefficients. The differences in state laws and the resources and efforts of law enforcement also affect the trafficking rates and detection rates.

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CONCLUSION

In this paper, we investigated the potential factors that influence human trafficking in the U.S. Using panel data from all fifty states and D.C. from 2016 to 2021, we found that economic development reduces human trafficking activities to a small but significant degree. This indicates that economic well-being repels trafficking instead of fostering it. We also found that high school graduation rates have a positive correlation with trafficking but college degree attainment rates do not. This contradicts the common belief that education helps to prevent trafficking exploitation. A possible reason is that education increases the awareness of trafficking activities leading to higher reporting rates. Furthermore, we found differences in trafficking among states which were attributed to the regional economic, social, legal, and geographical variations. These findings have important social and policy implications.

Future research can provide deeper insight into the effects of the studied factors on human trafficking. First, conducting qualitative research is essential to understand the context and mechanisms in states with both high education and high trafficking rates. Second, while our model demonstrates statistically significant explanatory power, it only accounts for about thirty percent of the variation in trafficking. There are additional variables that help clarify the relationship, such as economic inequality, urbanization levels, and law enforcement practice. It is also worth studying the topic in other contexts overseas to investigate the related factors.

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