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Brain Drain and Emigration: How Do They Affect Source
Countries?

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I. ABSTRACT

This paper examines the effect of different skill levels of emigration on a country's labor market, from high skill brain drain to low skill emigration. By utilizing an IADB Brain Drain data set to measure emigration rates among those with low, medium, and high educational attainment in a country, the effect of brain drain vs. low skill emigration on productivity and unemployment is examined. These data span from 1980 to 2010 with measurements every five years for 195 World Bank countries. By utilizing two two-way fixed effects models with GDP per capita and unemployment rate as the dependent variables, the results indicate that medium skill emigration reduces productivity, confirming a portion of the concept of "Brain Drain." Low skill emigration also reduces unemployment, and there is evidence of upward pressure on the wages of stayers. Therefore, there are possible benefits and drawbacks of emigration depending on the skill level of the emigrants.

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II. INTRODUCTION

Workers all over the world emigrate from their home countries to seek better wages, job prospects, and other opportunities. For example, individuals emigrating from Eastern Europe to the UK earn on average 2.5 times more than they would in their home countries. Emigrants advance to a better quality of life while host countries enjoy the benefits of immigrant labor. Brain Drain, however, is the negative implication of highly skilled individuals leaving their host country due to a loss in human capital or a reduction in the size of the workforce. Many European countries have experienced record declines in population due to emigration, including Lithuania, Romania, Bulgaria, and Poland. This paper examines whether or not “brain drain” occurs as a result of highly skilled emigration. Countries experiencing brain drain could be met with serious implications, including substantial losses in highly skilled productivity and GDP growth. Theory suggests that mass emigration should also cause a labor shortage in the home country, driving up the wage and decreasing unemployment (Pryymachenko et. al., 2013; Elsner, 2013). This does not take into account the loss of human capital (“best and brightest” managers, researchers, or professors) to other countries. The Baltic states, Poland, and others have experienced a strong negative outflow of workers. These countries have initiated campaigns to bring their citizens back, offering incentives such as tax breaks or even free airfare back home. As countries are evaluating how emigration affects their economies, the question becomes important: What is the effect of emigration on the source country’s productivity and unemployment?

As nations assess ways to integrate labor markets across borders, the effect of emigration on the source country’s productivity and unemployment needs to be examined. In the case of Eastern Europe, a net outflow of workers is expected, as unemployed workers seek employment

elsewhere or employed workers seek better pay. Large scale migration of highly skilled workers is also very prevalent in many countries in Africa, where doctors frequently emigrate to developed countries seeking better wages.

This topic is most important for middle income countries where “Brain Drain” is most prevalent. Nations spend large amounts of time, money, and other resources to educate, train, and prepare professionals for highly productive employment. It is difficult to estimate the effect on the source economy when these highly skilled workers emigrate. This reduction in the stock of human capital could have positive or negative effects, depending on the theory applied to the situation.

III. REVIEW OF THE LITERATURE

The effect of emigration on unemployment and wages have been studied extensively. Most research concludes that emigration does reduce unemployment and put upward pressure on wages in the source country due to Borjas’ model of the labor market (Borjas 2005). However, studies utilizing the concept of “Brain Drain,” or a country losing their best, brightest, and most productive workers discover conflicting results. Mountford (1995) argues that a brain drain can be paradoxically good for the source country. As successful emigration is not a certainty, there is more incentive for workers to obtain more education and human capital at home, increasing per capita GDP and making the economy and its workers better off. The opportunity to emigrate increases the marginal return to schooling and/or human capital formation, as more human capital-rich workers are much more likely to successfully increase their quality of life either abroad or at home.

Consistent with theoretical predictions, Elsner (2010) found that emigration is beneficial for the origin workforce in the form of higher wages, but only among men. Women did not benefit from a higher wage as a result of emigration in his study of Lithuania. Interestingly, unmarried men experienced higher wage gains than married men. The intuition behind this makes sense, as unmarried men do not have as many barriers to emigration (wives or children) and therefore are more likely to emigrate, creating a more intense labor shortage in this group and pushing up the wage more strongly.

Using data from eight countries that joined the European Union in 2004, Pryymachenko et. al. finds that emigration has a strong significant negative effect on the unemployment rate in source countries (2013). However, this study does not control for education, experience, or other human capital indicators. Severe labor shortages in select industries or occupations may result in a large loss of productivity, regardless of the fact that unemployment is reduced as a whole. If there is a labor shortage in highly skilled fields such as medicine, engineering, or upper level management; productivity and economic well-being could suffer greatly, as these highly skilled professionals are essential to sustained economic growth. If the majority of workers who emigrate are low skill and highly likely to be unemployed, unskilled labor migrating elsewhere is beneficial, highlighted by the decrease in unemployment.

Mishra concludes that emigration had a strong and positive effect on Mexican wages between 1970 and 2000 (2005). Although the regression controls for fixed effects of schooling, experience, and time, the majority of Mexicans emigrating to the United States tend to be low-skill workers; therefore mitigating the effect of brain drain. Additionally, a high percentage of undocumented immigration to the United States makes it difficult to draw accurate conclusions

due to potentially inaccurate or unreliable data. These limitations could cause substantial bias when measuring the effects of emigration on an economy.

Elsner finds that there is no effect of emigration on the wage distribution between low and high skilled workers, but a differential effect on wages based on the age of the worker (2011). In the short run, young workers who remain in their home country benefit through higher wages and more employment, while older workers experience the opposite effect with lower wages and higher unemployment. This is likely due to the fact that most emigrants are younger workers, as they have fewer barriers to emigration. He concludes that a brain drain did not occur in Lithuania, but rather a general migration of young workers among all education and skill levels. This paper intends to break down the effect of emigration by skill level, which has not been examined in previous literature.

The end goal of this paper will be to examine the net effect of different types of emigration (from brain drain to low skill labor) on the source country. Unemployment rate and productivity (GDP per capita) are effective measures of an economy's health and its labor market; therefore these are the variables of interest in this research.

IV. THEORETICAL MODEL DEVELOPMENT

The theoretical model behind the unemployment analysis in this paper is Borjas' textbook model of the labor market (Borjas 2005). The unemployment figure is reduced in two ways as a result of emigration: first, unemployed workers seek jobs in other countries, lowering the number of unemployed workers, which by definition reduces the unemployment rate. Second, employed workers move to other countries seeking better jobs with higher wages, better conditions, or better lives for their families, which opens up their jobs to others. Both of these situations decrease the unemployment rate by definition.

Productivity and emigration are also related in a similar manner. When mass emigration occurs, the labor force gets smaller; therefore there are less workers to potentially supply firms with labor. Assuming that firms' demand for labor remains constant, the reduction in the supply of workers would lead to a labor shortage. Less workers supplied proportionate to the same amount of jobs will put upward pressure on wages because firms demand the same amount of labor from less workers. This increases wages by giving workers increased bargaining power, forcing firms to attract more workers with higher wages. This upward pressure on wages most likely occurs primarily among low skilled workers because they are considerably more substitutable than highly skilled workers.

Contrary to low skill emigration, theory suggests that high skill emigration reduces productivity in the source country, therefore simultaneously reducing wages. The overall stock of human capital in the country decreases when workers with significant human capital leave. Less human capital suggests an inevitable loss in productivity. Along similar lines, severe labor shortages in highly skilled fields such as medicine or engineering can be detrimental to a country's productivity (and well-being). These workers cannot be quickly trained or substituted; therefore the demand for this type of labor cannot be adequately met in a timely manner.

The conflicting ideas regarding the economic relationship between emigration and productivity further illustrates the need for additional research in this area. The term "Brain Drain" implies a negative effect when workers leave their home country in search of employment elsewhere. Domestic universities, private companies, hospitals, and other employers cannot pay the high wages that are being offered in developed economies. Highly skilled workers are contributing their skills and specialties elsewhere in the global economy once they

leave the source country. While the countries receiving these highly skilled emigrants enjoy the economic benefits of these workers, the source countries lose them.

As discussed above, Brain Drain can have negative impacts on an economy. Mountford, however, has found reason to believe its effects can also be good (1995). As stated in the literature review, Mountford discusses the theory that human capital flight can actually improve a country's stock of human capital. When emigration is a possibility, the marginal return of an additional year of schooling, experience or training increases. A higher level of education and human capital will increase a worker's employability and wage whether they remain in their home country or emigrate elsewhere. This provides a strong draw for workers to obtain more human capital, which increases their productivity.

Based on theory and previous research, the prediction for this paper is that highly skilled emigration will reduce productivity, while low skill emigration will decrease the unemployment rate and increase low skill wages.

V. MODEL SPECIFICATION AND RESULTS

In order to model changes in productivity as a result of emigration, the Cobb-Douglas production function is used. This function states that economic output is a function of capital and labor. GDP per capita will measure output, while gross investment in capital will measure capital in a country and population will serve as a proxy variable to measure labor. Educational attainment and government expenditures are also used in the regression to control for other differences that influence productivity. Increases in capital, labor, educational attainment, and government expenditures should increase productivity in a given country. By using these variables in tandem with emigration rates, the effect of emigration is isolated and can be examined. The fixed effects in this model are country (i) and year (t), and the model is a two-way

fixed effects specification. The natural log is taken for all variables measured in 2010 U.S. dollars and for the population variable. The econometric specification is outlined below:

$$\ln GDPPC_{i,t} = \beta_{1,i,t} + \beta_2 EmigrationRates_{i,t} + \beta_3 \ln InvstmtPC_{i,t} + \beta_4 \ln Population_{i,t} + \beta_5 \ln GovtExpPC_{i,t} + \beta_6 Education_{i,t} + \phi_i + \mu_t + \varepsilon_{i,t}$$

To measure the effect of emigration on unemployment, another two-way fixed effects model is used. Unemployment rate is regressed with the emigration rates and the control variables GDP per capita and educational attainment. The natural log is taken for GDP per capita. The fixed effects in this model are country (i) and year (t).

$$UnemploymentRate_{i,t} = \beta_{1,i,t} + \beta_2 EmigrationRates_{i,t} + \beta_3 \ln GDPPC_{i,t} + \beta_4 Education_{i,t} + \phi_i + \mu_t + \varepsilon_{i,t}$$

Emigration rates are defined by the emigrant population over the total population, separated by skill level. Low skill workers have lower secondary, primary, or no schooling; medium skill workers have a high school leaving certificate or equivalent; and high skill workers have higher than a high school leaving certificate or equivalent. Further definitions and the data sources for these variables can be found in Appendix A. Tables of results for these regressions are found in Appendices B and C.

VI. INTERPRETATION OF RESULTS

PRODUCTIVITY (GDP PER CAPITA)

The significant variables of interest in this regression are medium and low skill emigration. Medium skill emigration does have a negative estimate, indicating a portion of the brain drain concept is confirmed. Increased emigration of workers who have completed high school or equivalent does reduce productivity in the source country. Interestingly, low skill emigration has a significant positive estimate, which could be because of upward pressure on wages due to a less saturated labor market for low skill workers.

UNEMPLOYMENT

The significant negative estimate of low skill emigration on unemployment confirms this positive impact of emigration. An increase in the low skill emigration level from a country does reduce the unemployment rate for workers that stay. This is concurrent with the economic theory, which states that low skill emigration reduces unemployment in the source country due to changes in the labor market.

VII. CONCLUSION AND FUTURE RESEARCH

Based on the results above, the negative impacts of “Brain Drain” are partially confirmed. Countries that lose more of their medium skill workers suffer from reductions in productivity, most likely due to a loss in the total stock of human capital. Emigration as a whole can also have positive impacts on a country, however. Emigration of low skill workers decreases unemployment, and provides better opportunities for those workers elsewhere. They benefit from employment and higher wages abroad, which might not have been possible in their home labor market. In addition, the positive estimate for the effect of low skill emigration on productivity indicates that low skill individuals who remain in the source country could enjoy higher wages.

There are several limitations to this research. Availability of data greatly reduced the number of observations used in the empirical model. There are 1,309 observations for emigration rates, but the other variables reduce the observations used to around 600 and 400 for productivity and unemployment, respectively. This is a loss of more than half of the data – and has the potential to alter the results. In the future, if more data can be gathered, more conclusive results might be discovered.

Additionally, GDP per capita does not account for remittances received from workers that have emigrated abroad. Many workers who emigrate send money back to their home country to support their family or friends, and this is not accounted for in the econometric model. Adding a variable to control for this or using a different measure of productivity such as gross national product could account for this added factor.

Finally, the human capital measurement aspect of emigration rates is limited. The highest measure for a person's human capital is only "more than high school," with no indication of the educational attainment beyond this. If data can be obtained that differentiates between some college, a completed bachelor's degree, master's degree, doctoral work, or professional degree, the true effect of brain drain can be examined further.

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APPENDIX A: VARIABLE DEFINITIONS AND SUMMARY STATISTICS

Variable Name	Source	Description
Emigration Rate	IAB (Institute for Employment Research), Germany: 'Brain-Drain Data' ¹	1980-2010, measured every 5 years. Emigration rates by country and education level (Low, Medium, High)
GDP per Capita	World Bank DataBank ²	Gross Domestic Product per capita, 1980-2010, 2010 USD
Unemployment Rate	World Bank DataBank ²	Unemployment Percentage, 1980-2010
Government Expenditures Per Capita	World Bank DataBank ²	Government expenditures in the economy, scaled by population, 1980-2010, 2010 USD
Investment Per Capita	World Bank DataBank ²	Gross investment in capital, scaled by population, 1980-2010, 2010 USD
Population	World Bank DataBank ²	Population of a country
Educational Attainment	World Bank DataBank ²	Mean years of schooling, age 15+ (Barro-Lee)

¹ Brücker H., Capuano, S. and Marfouk, A. (2013). Education, gender and international migration: insights from a panel-dataset 1980-2010, mimeo.

² World Development Indicators, The World Bank.

Variable	N	Mean	Minimum	Maximum
Low Skill Emigration %	1309	5.36	0	80
Medium Skill Emigration %	1309	5.26	0	47
High Skill Emigration %	1309	19.19	0	100
GDP per Capita (2010 USD)	1134	11,033.85	115.79	144,246.37
Unemployment Rate %	638	8.26	.20	37.20
Government Expenditures per Capita (2010 USD)	809	12,470.21	.81	2,430,852.81
Investment per Capita (2010 USD)	799	15,979.72	1.21	4,329,377.52
Population	1307	34,206,687	7,488	1,337,705,000
Educational Attainment	994	6.87	.23	13.18

APPENDIX B: TABLE OF RESULTS, NATURAL LOG OF GDP PER CAPITA

GDP per Capita (Natural log)		
	OLS	Fixed Effects (Two-way)
Intercept	.8053* (1.73)	-2.1570*** (-3.85)
High Skill Emigration %	-0.0023 (-0.73)	-0.0014 (-0.75)
Medium Skill Emigration %	0.0123 (1.48)	-0.0139*** (-3.36)
Low Skill Emigration %	0.0318*** (5.89)	0.0126*** (3.25)
Government Expenditures per Capita, 2010 USD, natural log	0.5338*** (8.64)	0.1693*** (5.90)
Population, natural log	0.2112*** (9.22)	0.4358*** (16.79)
Investment per Capita, 2010 USD, natural log	0.0604 (0.97)	0.2648*** (12.22)
Educational Attainment	.0236* (1.85)	-0.0031 (-0.76)
F-Test		
	170.86	119.43
Adjusted R-Squared		
	0.6587	.9915
Number of Observations Used		
	617	616
<i>Note: Figures in parentheses are t-statistics; *, **, *** denote 90%, 95%, and 99% statistical significance</i>		

APPENDIX C: TABLE OF RESULTS, UNEMPLOYMENT RATE

Unemployment Rate		
	OLS	Fixed Effects (Two-way)
Intercept	12.5509*** (6.75)	31.0190*** (3.86)
High Skill Emigration %	0.0247 (1.06)	0.0685 (1.36)
Medium Skill Emigration %	0.1139* (1.96)	0.0941 (1.22)
Low Skill Emigration %	0.0813** (2.01)	-0.1498** (-2.25)
GDP per Capita (2010 USD), natural log	-0.8299*** (-4.14)	-2.7918*** (-2.72)
Educational Attainment	0.1678* (1.76)	0.1593 (1.55)
F-Test	9.91	8.29
Adjusted R-Squared	0.1022	.7541
Number of Observations Used	441	440
<i>Note: Figures in parentheses are t-statistics; *, **, *** denote 90%, 95%, and 99% statistical significance</i>		