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The efficiency of human capital allocations in developing countries

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ABSTRACT

For a set of 14 developing countries I evaluate whether differences in wage gaps between sectors – estimated from individual-level wage data – have meaningful effects on aggregate productivity. Under the most generous assumptions regarding the homogeneity of human capital, my analysis shows that eliminating wedges between wages in different sectors leads to gains in output of less than 5% for most countries. These estimated gains of reallocation represent an upper bound as some of the observed differences in wages are due to unmeasured human capital. Under reasonable assumptions on the amount of unmeasured human capital the gains from reallocation fall well below 3%. Compared to similar estimates made using data from the U.S., developing countries would gain more from a reallocation of human capital, but the differences are too small to account for a meaningful portion of the gap in income per capita with the United States.

1. Introduction

A prominent feature of developing economies is the wide variation in labor productivity between different sectors. Gollin, Lagakos, and Waugh (2013) document that agricultural labor productivity is typically about one-half the level of non-agriculture, echoing the work of Lewis (1954) on dual economies. Moreover, this productivity gap appear appears to be most pronounced in the poorest countries, a fact noted by Kuznetz (1971), and explored further by Gollin et al. (2002), Caselli (2005), and Restuccia et al. (2008). Beyond just agriculture and non-agriculture, McMillan and Rodrik (2011) document that large differences in labor productivity exist across ten broad sectors within each country they study.[1]

If these disparities reflect real differences in the marginal productivity of labor between sectors, then aggregate productivity is lower than its potential, offering a partial explanation for low measured total factor productivity in developing countries. Several papers have attempted to estimate the loss in aggregate productivity from such misallocations. Focusing on only the distinction between agriculture and non-agriculture, Chanda and Dalgaard (2008), Vollrath (2009a), and Cordoba and Ripoll (2009) all suggest that there are substantial losses due to misallocations, while Caselli (2005) and Graham and Temple (2006) find much smaller effects.[2]

The existing literature infers differences in the marginal product of labor and/or human capital between sectors based on aggregate level information on output and labor inputs. Gollin et al. (2013) are the most sophisticated in addressing the measurement issues arising from the use of this data. They employ census and survey data to adjust for differences in education and hours worked between sectors, as well as providing evidence that national accounts data provide a reasonable measure of agricultural value-added.[3] After their adjustments, they continue to find large gaps in human capital productivity between agriculture and non-agriculture.

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[1] MacMillan and Rodrik's calculations also show that shifts of labor between sectors are an important part of economic growth, although the contribution is not necessarily positive. In Latin American and Sub-Saharan Africa sectoral shifts were actually a drag on growth in recent decades.

[2] These papers are part of a wider literature looking at variation in factor returns and the allocation of factors across different uses. Banarjee and Duflo (2005) discuss the wide variation in factor prices found within developing countries. Looking specifically at firms, Hsieh and Klenow (2009) find that misallocation of physical capital and labor across firms in India and China lowers output by around 30% relative to the United States. There is a growing literature on productivity differences across firms and their relationship with aggregate productivity. See Foster et al. (2001) and Syverson (2011) for overviews of this literature. Similarly, Restuccia and Rogerson (2008) find large effects of dispersion in firm's revenue productivity on aggregate productivity. Jones (2011) discusses how misallocations of factors of production can lead to lower productivity because of the input/output relationships between industries.

[3] Herrendorf and Schoellman (2011) find that measures of agricultural value-added in the United States are actually inaccurate given the accounting treatment of the income of farm proprietors.

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In this paper I examine the aggregate impact of labor misallocation from the "bottom-up", using individual level wage data to identify wedges between sectors. Given the observed wedges between sectors, I then calculate the hypothetical gain to aggregate productivity from eliminating those wedges. I do this for a set of 14 developing countries.[4] The data are derived from the Living Standard Measurement Surveys organized by the World Bank and are collated by the Rural Income Generating Activity Database produced by Davis et al. (2010). Despite the name the database contains information on urban workers as well as rural.

In the raw data there exist substantial wedges between sectors in the wage per day within almost every country I study. Fig. 1 shows the average wage in each sector relative to the average wage for each of the 15 surveys I use (there are two surveys for Nicaragua). The nine sectors shown for each country are a standard ISIC (revision 2) breakdown, with the Miscellaneous sector omitted. Agriculture (represented by the dark circles) tends to have wages well below the country average, dipping to only 50% of average wages in Ecuador and Nigeria. Sectors that have consistently high wages are Finance and business services (the open squares) and Utilities (the dark squares), with wages 1.5–2.5 times higher than average in each country.

Of course, much of the variation in wages between sectors in the countries in Fig. 1 reflects human capital differences, rather than differences in the wage paid per unit of human capital. I will explain the nature of the data and the precise estimation below, but Fig. 2 plots the residual wage per day in each sector after I have removed the influence of human capital using a simple Mincerian regression for each country that includes education, age, and occupation. As can be seen, there is much less variation in Fig. 2 within each country.

Regardless, there is still noticeable variation. In Ghana, for example, the wage paid to a unit of human capital in mining is 2.5 times the average across all workers in that country. In Nigeria and Ecuador the wage rate in agriculture is still roughly 50% of the average wage. Tajikistan exhibits several sectors with wages nearly 2 times the national average.

Do the wage differences in Figs. 1 and 2 imply a significant aggregate productivity loss within developing economies? An answer to that question requires finding the hypothetical productivity level when wedges between sector-level wages are eliminated. For that calculation I start by making several assumptions designed to maximize the productivity gain from reallocation. First, I assume that all units of human capital within a country are perfect substitutes. This implies there is no loss of productivity for a unit of human capital when it shifts sectors. Secondly, I assume that there is no unmeasured human capital. This implies that the wage wedges seen in the figures reflect real differences in wages, rather than differences in unmeasured skills between sectors.

Despite these very strong assumptions, my calculations show that productivity after removing the wage wedges would rise by less than 5% for 11 of the 14 countries. For 13 of the 14, the productivity gain is less than 11%, and the gain only reaches 15% in Tajikistan. For comparison purposes, the implied productivity gain from reallocation across sectors in the United States, calculated using data from the Current Population Survey in 2000, is approximately 1.8%. While the U.S. appears to have a more efficient allocation, the difference between it and the developing countries is not terribly large. Moreover, the misallocation of human capital does not explain much of the gap in income per capita between these countries and the United States. As an example, income per capita in the U.S. in 2004 was about 22 times that in Nigeria. If wage wedges were eliminated between sectors in Nigeria, that ratio would only fall to about 19.5. For other countries the explanatory power of misallocation across sectors is even smaller.

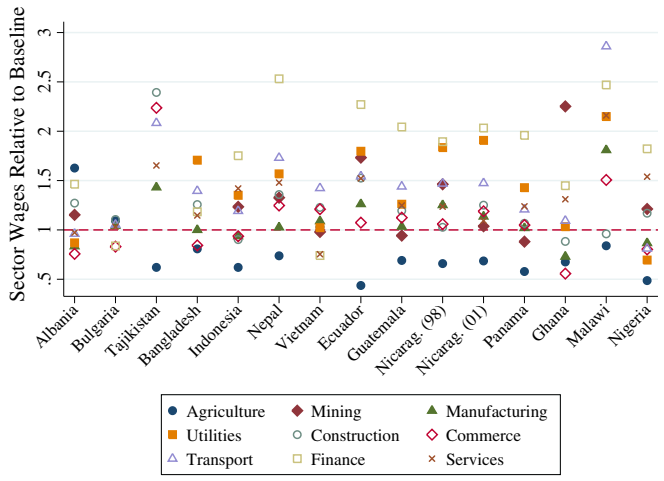

Fig. 1. Average earnings per worker per day, by sector, by country. Note: The figure shows, for each country, the average wage per day in a sector relative to the average wage for the entire country $(1+\tau_j^W)$, without any controls for human capital. Author's calculations using the RIGA database of Davis et al. (2010). See text for details.

In comparison to the prior literature, the implied productivity gains I find here are quite small. Hsieh and Klenow (2009) report gains to manufacturing TFP of around 100% for China and India from reallocating factors between firms. Vollrath (2009a) finds gains on the order of 150% for some sub-Saharan African countries from reallocating labor between agriculture and non-agriculture. The gains I find here do not necessarily contradict those findings. Those papers use aggregate data and assumptions about production functions to identify (and then remove) marginal product wedges between sectors or firms. In this paper I am looking only at *wage* wedges between sectors. It is quite possible that while wage gaps (and the gains from eliminating them) may be small, marginal product gaps (and the gains from eliminating them) could still be large. This would be the case if there was an additional wedge between the marginal product of labor and the wage *within* each sector. Eliminating wage gaps is thus a subset of the total productivity gains available from eliminating marginal product gaps.

Furthermore, I am calculating the *static* gains from reallocation. That is, I am holding physical capital and total factor productivity (TFP) constant in each sector in making my calculations, and hence the marginal product of human capital falls as more human capital flows into a sector.

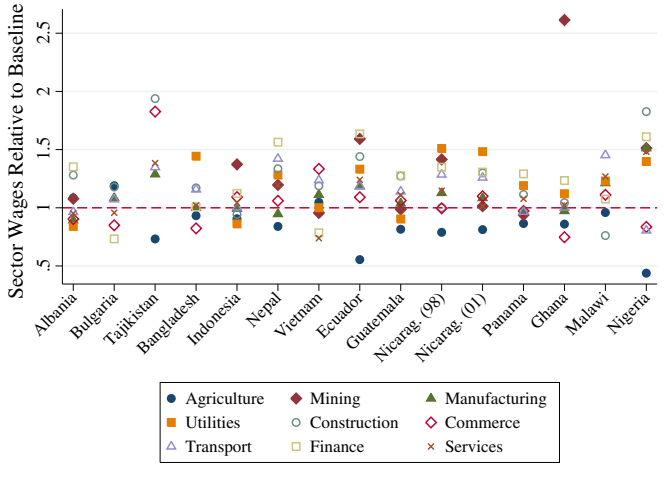

Fig. 2. Average earnings per worker per day controlling for human capital, by sector, by country. Note: The figure shows, for each country, the average wage per day in a sector relative to the average residual wage for the entire country $(1+\tau_j^W)$, after controlling for human capital characteristics (education, age, occupation, and occupation-specific education returns). Author's calculations using the RIGA database of Davis et al. (2010), see text for details.

[4] The countries are Albania, Bangladesh, Bulgaria, Ecuador, Ghana, Guatemala, Indonesia, Malawi, Nepal, Nicaragua, Nigeria, Panama, Tajikistan, and Vietnam. The surveys from Ecuador, Nicaragua, and Vietnam are from the late 1990s, and the rest are from the 2000s.