

# Economic Structure, Allocation of Human Capital and Growth\*

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## Abstract

This article makes (3) contributions. Firstly, it argues that a country's economic structure is an important determinant of the allocation of human capital between rent seeking and entrepreneurship — this is contrary to the institutions view. Secondly, it identifies two mechanisms through which the allocation of human capital affects economic performance: 1. its effect on capital accumulation and 2. its effect on both firm size and efficiency. Finally, the paper shows that growth regressions are mis-specified since they do not explicitly control for the allocation of human capital. This article uses data from the University of Guyana to show that human capital is inefficiently allocated between entrepreneurship and rent seeking. It highlights the nexus between Guyana's low skills intensive economic structure and its education system. Preliminary evidence is also provided to demonstrate the growth effects of this inefficient allocation. On the policy front, the paper calls for structural transformation as a means to improve the allocation of human capital and by extension, economic performance.

**Keywords:** rent seeking, entrepreneurship, growth, human capital, Guyana

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# 1 Introduction

The Classical economists, Marx, Schumpeter and the modern entrepreneurship literature emphasize the transformational role of the entrepreneur. This transformation is undertaken through the process of creative destruction where the entrepreneur transcends markets through innovation ([Schumpeter \(1994\)](#)). It is difficult to conceive of capitalism without the entrepreneur. But what determines the allocation of human capital between entrepreneurship and rent seeking?

We argue that an economy's structure shapes the relative payoff structure and by extension, determines the allocation of human capital. This is in contrast to [Baumol \(1996\)](#), [Murphy and Vishny \(1991\)](#), [Murphy and Vishny \(1993\)](#), [Dau and Cuervo-Cazurra \(2014\)](#), [Ebeke and Omgba \(2011\)](#) and others. These authors contend that property rights, governance capabilities or institutions more generally, are the fundamental determinants. The *FIRE* (finance, insurance and real estate) economy characterizes much of the developed world, in particular, it offers exceptionally high returns. Consequently, highly skilled human capital engages in *financial destruction* as opposed to Schumpeter's *creative destruction*, which leads to financial crises. Economic structures matter — they determine the allocation of human capital and subsequent economic performance. Crucially, this is no less true in poor and developing countries.

The idea that it is not education *per se* that matters for growth but how it is allocated parallels an argument advanced by [Hausmann et al. \(2007\)](#). These authors claim that what you export matters a lot more for growth than exports generally. These ideas imply that a negative statistical relationship between growth and education does not necessarily indicate a poorly specified model. It could suggest an *inefficient* allocation of human capital. But this insight is yet to find its way in the work-horse growth models or the mainstream's literature on human capital. It follows that growth regressions that do not control for the allocation of human capital produce biased estimates.

In this article, we present a theoretical framework to explain the determinants of the allocation of human capital and highlight the key channels through allocation matters for economic growth. We demonstrate that the allocation of human capital matters for firm size and efficiency and crucially, for the overall rate of capital accumulation. A low entrepreneurship to rent seeking ratio is consistent with small firms and relatively less accumulation. However, large firms as in the case of the developed world also suffer from low efficiency due

to massive rent seeking. It follows that there is a non-linear relationship between accumulation and an increasing ratio of entrepreneurship to rent seeking. We also analyze the stability conditions of the allocation of human capital and prove that the market outcome is a stable equilibrium. Thus, market forces will not automatically correct an inefficient allocation — industrial policies become necessary to improve labour market efficiency and by extension, economic growth.

The remainder of the paper is organized as follows. [Section 2](#) presents our theoretical framework and [section 3](#) provides an overview of the competing explanations for why human capital might be negative and insignificant in growth regressions. [Section 4](#) undertakes a Guyana case study, followed by a brief discussion in [section 5](#) and finally, [section 6](#) concludes.

## 2 The Model

### 2.1 Allocation of Human Capital

Material development is realized when the dynamics of the labour market channel increasingly skilled labour into productive employment. [Smith \(1993\)](#) has likened the latter to value added creation and distinguished this from unproductive or rent seeking employment. A labour market with highly skilled labour is less likely to produce commodities with decreasing returns and low income elasticity of demand in world markets. This reasoning explains why great economic significance is attached to education or schooling. But this article and the rent seeking and entrepreneurship literature ([Murphy and Vishny \(1991\)](#), [Douhan and Henrekson \(2010\)](#), and [Baumol \(1996\)](#)) insist that the *allocation* of human capital is the primary determinant of the influence that education has on economic growth.

We define human capital ( $H_K$ ) as ideas, skills and knowledge embodied in labour. Entrepreneurship is any activity that leads to capital formation while capital consumption is undertaken through rent seeking. Unlike [Murphy and Vishny \(1991\)](#), we subsume workers into either entrepreneurs or rent seekers. Some workers will engage in economic activities at the firm level that increases capital accumulation and others through their economic activities will either reduce capital formation or not affect it at all. This broad view allows us to focus on the point we wish make — that the allocation of  $H_K$  affects short run growth and the level of income through its influence on capital formation.

The total quantity of  $H_K$  and the labour market clearing condition is described in (1),

where  $H_E$  and  $H_R$  are the number of entrepreneurs and rent seekers respectively. Equation (2) shows how the ratio of entrepreneurs to rent seekers ( $H_E/H_R$ ) is determined by the relative returns ( $r_E/r_R$ ), which in turn is a function of the economy's structure ( $\phi$ ). The latter can be defined at various levels but for our purpose we take the sectoral view — an economic structure refers to the sectoral contributions to GDP. We argue that a given economic structure has a given structure of occupational rents that determines the structure of the labour market. For instance, FIRE economies demand financial entrepreneurs while largely agricultural economies have a labour market structure that corresponds to its economic system. An economy with excessive rent seeking or too many lawyers, as in [Murphy and Vishny \(1991\)](#); is principally a phenomenon of the economic structure as opposed to institutional failure. As  $\phi$  changes, market conditions are altered and this affects  $r_E/r_R$  and the allocation of  $H_K$ , or more specifically,  $H_E/H_R$ .

$$H_K = H_E + H_R \tag{1}$$

$$H_E/H_R = r_E/r_R = \phi \tag{2}$$

## 2.2 Capital Accumulation

Our central thesis is that the allocation of  $H_K$  determines the rate of capital formation and this is depicted in (4), which is the logarithmic form of (3). Countries with a relatively low ratio of  $H_E/H_R$  will endure low rates of accumulation, *ceteris paribus* — since  $H_K$  is allocated towards capital consumption (non-tradable economic activities for example) rather than accumulation. Some public sector employment can also be considered capital consumption if a reallocation of  $H_K$  towards the private sector increases capital accumulation. Note that in some countries this is not necessarily the case, since public enterprises and public investment can be important sources of capital formation. The idea that the allocation of  $H_K$  is key for accumulation is unlike the mainstream's view of the savings-investment nexus. The contention that higher savings are needed for investment is at best a *necessary* but not a *sufficient* condition for capital accumulation. Whether savings are invested depend on the allocation of  $H_K$ , *ceteris paribus*.

$$K(t) = (H_E/H_R)/(H_E/H_R)^2(t) \tag{3}$$

$$\log K(t) = \log(H_E/H_R)(t) - 2\log(H_E/H_R)(t) \tag{4}$$

**Proposition 1** *The allocation of human capital is a significant determinant of capital formation.*

A relatively high ratio of  $H_E/H_R$  increases accumulation but our non-linear modeling shows that there are limits to an increasing ratio of  $H_E/H_R$ . Consider the following — an economy has  $m$  number of firms, each of  $\gamma$  size. As  $H_E/H_R$  increases, so does  $\gamma$  but  $m$  falls as a consequence — this can be explained by mergers and acquisitions. Greater capital formation increases the size of the market and through increased profitability, firms grow in both market share and influence. Also, when firms grow in size, they grow both vertically and horizontally, thereby, changing the sectoral contributions to GDP or  $\phi$ . Given (2),  $r_E/r_R$  and  $H_E/H_R$  must change. As firms increase in size, there is a point when entrepreneurs become rent seekers. Note,  $H_E/H_R$  does not change *per se* but its functional role for capital accumulation does. Unlike small firms, the retained earnings in large firms are so substantial that managers can influence their own share prices through share buybacks. This ability leads to a new investment strategy at the *expense* of capital formation and this is captured in  $-2\log(H_E/H_R)(t)$ .

Lazonick and O’Sullivan (2000) calls this new strategy shareholder value and argues that it is a sharp shift in business philosophy that is tied to the historically unprecedented growth in firm size. There are many empirical studies that show how the increase in firm size and retained earnings reduce accumulation (Stockhammer (2006), Stiglitz (2013), and Bowles and Boyer (1995) among others). In the context of our model, the rise of shareholder value *effectively* reduces  $r_E/r_R$  and leads to an *effective* change in the allocation of  $H_K$ , which adversely affects capital accumulation. This analysis provides us with a continuum of firm sizes with rent seeking at both extremes. In poor countries with little entrepreneurship to rent seeking and where firms and markets are very small, capital accumulation is relatively low. Interestingly, at the other extreme, where firms are very large with a high ratio of  $H_E/H_R$  — rent seeking is also rampant and this is illustrated through relatively low accumulation.

**Proposition 2** *The given allocation of human capital in countries with very small and large firms reduces capital formation.*

Figure 1a illustrates the relationship between firm size on one hand and rent seeking and capital accumulation on the other. When firms are very small, their retained earnings and ability to acquire credit are limited — consequently, their rate and levels of capital formation

are small. This is depicted as  $a'$ , which corresponds to small firms of size  $FS_1$ . At point  $a$  it shows that firms of size  $FS_1$  engage in relatively high levels of rent seeking, which is explained by the fact that small firms undertake activities that are not credit intensive and high risk. In other words, they are primarily occupied with non-tradable activities, which is an important dimension of capital consumption — our preferred measure of rent seeking. Line segment  $f$  captures the inverse relationship between firm size and rent seeking. Note that firms can only grow in size through greater capital formation, which is the result of an improved allocation of  $H_K$ . Thus, movements along the line represents the process of structural transformation towards a more skills intensive economy.

Conversely, the line segment  $f'$  depicts the positive relationship between rent seeking and very large firms,  $FS_3$ . Line segment  $f'$  demonstrates the structural change towards a financialized economy, where share buybacks instead of capital investment is the dominant business strategy. In these economic structures, the allocation of  $H_K$  appears relatively efficient but they are not, since business leaders are effectively rent seekers in the sense that their business model leads to capital consumption at the expense of capital formation. This is demonstrated at points  $a'$  and  $a$ , which is consistent with firms of size  $FS_3$ . Point  $b$  captures the optimal firm size  $FS_2$  that maximizes the growth of capital stock and minimizes rent seeking. But point  $b$  should be understood as a *moving target* since what is optimal in a given economic structure, may be sub-optimal in an economy with different structural configurations.

It follows that at point  $b$ ,  $\dot{K}(t)$  is maximized at the optimal allocation of  $H_K$  shown in [Figure 1b](#) as  $H_E/H_R^*$ . As in the case with firm size, the optimal allocation of  $H_K$  is a moving target and differs across space and time depending on the structural features of economies. The upward sloping segment in [Figure 1b](#) is consistent with line segment  $f$  in [Figure 1a](#) and the downward sloping segment is consistent with increasing rent seeking depicted in line segment  $f'$ . In rich countries, the allocation of  $H_K$  exceed the optimal point of  $H_E/H_R^*$  while developing countries have an *inefficient* allocation of  $H_K$  below  $H_E/H_R^*$ . These different allocations explain why many poor and developing countries are notorious for having small firms, while richer countries have bigger firms.

We now fully specify the rate of capital formation  $\dot{K}(t)$  in (5), where  $sY(t)$  and  $(n+\delta)K(t)$  are total savings and depreciation respectively. Population grows exogenously at rate  $(n)$  and capital depreciates at rate  $(\delta)$ .  $Y(t)$  assumes the familiar Cobb-Douglas form shown in (6), where we have suppressed time subscripts for convenience. For simplicity, we assume

that technology  $A$  and  $H_K$  are constant through time, therefore, in principle, we can drop these terms. Equation (6) says that *per capita* income is not only determined by the stock of  $A$ ,  $H_K, K$ , but also how  $H_K$  is allocated.

$$\dot{K}(t) = sY(t) - (n + \delta)K(t) \quad (5)$$

$$Y = A(K)^\alpha (H_K, (H_E/H_R)/(H_E/H_R)^2)^\beta \quad (6)$$

### 2.2.1 The Allocation of Human Capital as a Stable Equilibrium

Though we have identified optimal firm size and allocation of  $H_K$ , the evidence shows that the allocation of the latter tends to be stable either below or above  $H_E/H_R^*$ . In other words, the inefficient allocation of  $H_K$  in rich and poor countries tends to be a *stable* equilibrium outcome. This explains why structural change is slow and why it is difficult to move from points  $a$  and  $a'$  to point  $b$  in [Figure 1a](#). What are the mechanics of this stable equilibrium?

Consider [Figure 2](#), which illustrates the rent seeking curve as U shaped — at low and high levels of  $H_E/H_R$  rent seeking is relatively high — this is consistent with our analysis in [Figure 1a](#). The capital accumulation curve (shown as the  $\dot{K}(t)$  curve), is drawn as an inverted U shape and this is consistent with [Figure 1b](#). As  $H_E/H_R$  increases,  $\dot{K}(t)$  increases until rent seeking crowds out capital accumulation. Where the rent seeking and  $\dot{K}(t)$  curves intersect are the points of equilibrium — illustrating that the returns from rent seeking and capital accumulation are equal, so that  $H_E/H_R$  is stable.

Our non-linear modeling produces two equilibria — points  $c$  and  $c'$ . The former is an unstable equilibrium since at allocations below  $H_E/H_{R1}$ , the returns from rent seeking exceed the returns from accumulation, which depletes capital stock and pushes the allocation of  $H_K$  further below  $H_E/H_{R1}$ . At allocations above  $H_E/H_{R1}$ , the returns from capital accumulation exceed the returns from rent seeking and this leads to growth in capital stock and increases in  $H_E/H_R$  until the new equilibrium position is reached at  $c'$  and  $H_E/H_{R2}$ . In either case, any deviation away from the equilibrium position at  $c$  leads to unstable dynamics that pushes the allocation of  $H_K$  further away from its initial position of  $H_E/H_{R1}$ . Such unstable dynamics cannot explain the observed *stability* in economic structures and the allocation of  $H_K$ , therefore,  $c$  is an unrealistic equilibrium position and hence forth, ignored.

Now consider the equilibrium position at  $c'$  and  $H_E/H_{R2}$ . When the allocation of  $H_K$  is below  $H_E/H_{R2}$  the returns from accumulation exceed the returns from rent seeking, which pushes the allocation of  $H_K$  back to its initial equilibrium of  $H_E/H_{R2}$ . Similarly, at points

beyond  $H_E/H_{R2}$ , the returns from rent seeking exceed the returns from accumulation, which by definition reduces  $H_E/H_R$  to its initial equilibrium of  $H_E/H_{R2}$ . Thus, equilibrium  $c'$  is a stable equilibrium and can explain the observed stability in the allocation of  $H_K$  in the real world. The crucial insight from this analysis is that there are no market forces or pressures to change the allocation of  $H_K$ . For instance, if  $H_E/H_{R2}$  is below  $H_E/H_R^*$ , market forces or pressures will not improve the allocation to its optimal point of  $H_E/H_R^*$ . Rather, in the absence of intervention, market forces will ensure that the inefficient allocation persists.

## 2.3 Growth in Human Capital and Technology

If we relax the simplifying assumption that  $H_K$  is constant through time and allow it to increase over time, perhaps through the mechanism highlighted in [Lucas \(1988\)](#) — it hardly changes our key result. When the stock of  $H_K$  increases, skills and experience still need to be employed between rent seeking and entrepreneurship. Fundamentally, the stock of  $H_K$  increases within a given economic structure and thus, faces a unique payoff structure  $r_E/r_R$ . The underlying point is that the allocation of  $H_K$  remains an important determinant of economic change.

Since we do not endogenize technical change our growth model is essentially exogenous. But the points raised regarding growth in  $H_K$  also apply here. If we relax our simplifying assumption of a constant stock of  $A$  through time, we can assume that  $A$  grows endogenously as in [Romer \(1990\)](#) famous model, which emphasizes the role of the allocation of  $H_K$  in the production of  $A$ . But note that our central result remains — the new knowledge and technology created still needs to be distributed between rent seeking and entrepreneurial activities. While Romer shows that the allocation of  $H_K$  matters, in his model this is only limited to the production of  $A$  and not the production of output  $Y$ . If Romer's modeling strategy was correct, we would not observe growth models based on bubbles or Ponzi-like debt in the USA and other developed countries with sophisticated innovation systems.

## 3 Where has all the Education Gone?

[Lau et al. \(1991\)](#) estimated the effects of education by level of schooling for (5) regions and found that primary education has a negative effect in Africa and MENA, insignificant effects in South Asia and Latin America and was only positive and significant in East Asia. Findings



such as these forced scholars like Pritchett to ask a fundamental question: where has all the education gone? This led to a debate on how to model human capital in growth regressions. Is it the *level* or the *accumulation* of human capital that matters for the growth process? The logs of human capital were notorious for being negative and insignificant in growth regressions and scholars such as [Benhabib and Spiegel \(1994\)](#) and [Islam \(1995\)](#) ignored the problem altogether by using only level specifications in growth regressions. [Bernard and Jones \(1996\)](#) adds an interesting twist and posits that it is neither the level nor the accumulation of human capital that matters. Rather, they argue that growth empiricists should model the *rate of change in the level* of human capital.

[Pritchett \(2001\)](#) offers (3) explanations for the supposed education paradox: piracy, poor quality of education and diminishing marginal returns to education.

- *Piracy*. This argument is consistent with the institutions view — that weak institutions incentivize rent seeking and inefficiently allocate human capital between public and private sector employment. Pritchett adopts a narrow view of rent seeking and provides evidence of a growing share of public sector employment in developing countries. In his analysis, this type of employment is synonymous to piracy or extractive activities that reduce the returns from otherwise educated labour.
- *Poor Quality Education*. An alternative or complimentary explanation is the quality of education. Pritchett explains that low returns from human capital might be observed due to the poor quality of education systems and instruction. While labour may achieve a given level of schooling, the returns from schooling are closely related to the quality of schooling.
- *Low Marginal Returns*. Plainly put, the marginal returns from an additional year of schooling might be lower than the average returns. A fundamental theorem in labour economics is that the demand for labour is a *derived* demand. Pritchett notes that the demand for skilled labour increases (along with marginal returns) when the skill intensity of the economy rises, *ceteris paribus*. This points to the structure of an economy and the corresponding structure of aggregate demand.

Pritchett's third explanation is closest to our central thesis and in our estimation, Pritchett's collective explanation highlights a deeper point — that economic structures determine relative reward structures (derived demand for skilled labour) and by extension, the allocation of human capital and the growth process. In countries with economic structures

composed of low technology commodities that require mostly unskilled labour, the demand and returns for skilled labour are low, *ceteris paribus*. Still, these economies produce skilled labour — assuming that the education system is of a certain quality. So where does all the education go? As explained in the previous sections, human capital is inefficiently allocated between entrepreneurship and rent seeking in the sense that we have defined these terms. But we now add a second route of how the economic benefits of human capital escape host countries, that is, *migration*.

When the relative skill intensity of an economy is low, an economy suffers from an excess supply of skilled labour, *ceteris paribus*. Some of the surplus labour undoubtedly become under-employed in the host country, but given globalization, an increasing number migrates to other destinations with higher skills intensive economic structures, *ceteris paribus*. Given this, we should expect lower empirical estimates of returns from human capital in developing countries than theory would predict.

[Peng \(2009\)](#) argues that migration reduces rent seeking and increases growth through a brain gain effect. The essential argument is that only productive skills are transferrable through the migration process, thus, countries with a high migration rate will benefit from an improved allocation of  $H_K$  towards productive skills. Those that do not migrate (due to bad luck or financial constraints) increase output and productivity since they already possess productive skills. But [Peng \(2009\)](#) has a number of devastating shortcomings. Unless the migration process changes the relative reward structure within the host country, those who do not migrate become rent seekers and negate any brain gain or growth effect. At the very least, it is the expectation of migration that improves the allocation of human capital, when this expectation is not met; even those that possess productive skills enter rent seeking employment. Since [Peng \(2009\)](#) assumes that only productive skills are transferrable through the migration process, we should expect an inflow of productive skills into developed countries. But these countries are plagued with various forms of rent seeking in spite of the inflow of productive skills ([Haldance \(2010\)](#), [Kay \(2012\)](#), [Turner \(2012\)](#) and [Stiglitz \(2013\)](#)). It follows that the reward structure in developed countries also inefficiently allocate human capital and the incentive to migrate from less developed countries is the higher returns from rent seeking in developed countries. Fundamentally, it is doubtful that migration reduces rent seeking.

Let us return to the findings in [Lau et al. \(1991\)](#). East Asians are not known for good governance, low corruption or particularly strong institutions. Yet, the evidence shows that

human capital enhances growth in this region. What differentiates East Asia from Africa or Latin America? These regions are not necessarily less effective at reducing corruption or piracy. We posit that the underlying difference is the economic structure and the corresponding reward structure between entrepreneurship and rent seeking. East Asia is in the process of a structural transformation towards a more skill intensive economy and this improves its allocation of  $H_K$ , which produces a positive and statistically significant coefficient for the human capital variable in growth regressions. Africa and Latin American are known for being relatively less industrialized and skills intensive. Agriculture and natural resources play a far greater role in their process of economic change. Further, at the aggregate level, their economic structures exhibit little dynamism. Ergo, even as their governments allocate greater resources to education, schooling and human capital generally, we should expect only limited payoffs. But [Lau et al. \(1991\)](#) finds even stronger evidence, where schooling *reduces* economic growth.

The discussion thus far shows that growth regressions suffer from a specification bias. Unless growth empiricists control for the allocation effect of human capital, the education paradox will persist. We can now rewrite (6) in logarithmic form. For empirical estimations, researchers can add other control variables and also experiment with estimation in levels.

$$\log Y(t) = \log A + \alpha \log K + \beta(\log H_K + \log H_E/H_R - 2\log H_E/H_R)(t) \quad (7)$$

## 4 Allocation of Human Capital in Guyana

[Figure 3](#) and [Figure 4](#) illustrate the distribution of employment by major sectors in Guyana. [Figure 3](#) shows that the agriculture, fishing and hunting sector is the single largest employer. This is followed by the wholesale & retail trade and then the manufacturing sector. Interestingly, when the  $DI_nRT$  (distribution, non-tradable ICT, restaurants and transportation & storage) services are added together, the  $DI_nRT$  economy becomes the largest employer — see [Figure 4](#). Further, when the other services are added to the  $DI_nRT$  economy, the entire services industry employs 53% of Guyanese labour.

[Figure 5](#) illustrates the allocation of students among the various Faculties at the University of Guyana — the country’s only public tertiary institution and the largest University by any measure. In the academic year (2009/10) at least 45% of the entire student body were enrolled in programs within the the Faculty of Social Science. The School of Earth and

Environmental Sciences for instance, has the smallest percentage (less than 5%) of students enrolled in its program followed by the Faculty of Agriculture and Forestry. This article argues that the Faculties with poor enrollment rates provide skills that can increase the rate of capital formation and are therefore, necessary prerequisites for growth and development. The stereotype that Asians, particularly East Asians, are superb Mathematicians did not emerge out of thin air, it reveals the importance of the allocation of  $H_K$  for the purpose of development. Math intensive skills, Science, Technology and ICT are well known proximate causes of growth and well embedded in the development strategy of the East Asians. But to realize this growth, labour must be trained in these areas and the economy must intensively employ these skills.

Figure 5 is not a one off distribution, it represents the average distributional pattern at the University. We do not expect Social Science graduates to be employed in areas related to the Earth and Natural Sciences, thus, this enrollment distribution approximates the pattern of employment in Guyana. Crucially, the massive enrollment gap between the Social Science and other Faculties tells the story that  $r_E/r_R$  is highly skewed in favor of Social Science related employment. It is important to note that this does not mean that Social Science related skills are handsomely rewarded in Guyana, rather, it indicates the *pattern* of employment.

Figure 6 depicts the number of courses in the various Faculties with less than 15 students. The numbers are striking. Approximately 70% of the courses in the Faculties of Education Humanities and Agriculture Forestry have less than 15 students. The remaining Faculties with the exception of Social Science, fall within a range of 50%-60%. To the extent that these programs are critical for national development and capital formation, the evidence shows that  $H_K$  is inefficiently allocated. We would expect a growing and developing country to continually produce and hoard a great number of scientists of all persuasion, entrepreneurs and all other skills and talent that are needed for a “good” society. The evidence in Guyana suggests that there is an imbalance towards lawyers and social workers — just to name a few Social Science related skills.

Figure 7 displays the pass rates in Mathematics and English for high schools in Guyana during the period 1990-2014. These subject areas are used to determine basic competencies and are obvious prerequisites for development. Do you recall the East Asian Mathematics stereotype? A society that is well learned in Mathematics is more inclined to venture into rocket science and innovate, and more likely to transform its economy. The passing rates in

Mathematics are nothing short of dismal, it stands at 40% in 2014. Although the passing rates for English are relatively higher, it is still less than 50%. These high school passing rates can explain why the majority of students enroll in the Social Science Faculty at the University of Guyana. Given these rates, one would not expect an overwhelming number of new University students to enroll in the Natural Science and Technology Faculties, which are intensive in Mathematics. But why are passing rates so poor in the foundation subject areas?

The Guyana Poverty Reduction Strategy Paper (2011-2015) ([GOG \(2011\)](#)) provides evidence that the enrollment rates for primary and secondary schools exceed 90%. The government has a school feeding program and provide clothing and other essentials that make education a rewarding experience. Private schools and Universities in Guyana are also expanding, which indicates a robust demand for education. Yet, the majority of Guyanese students fail to meet the basic competency requirements. Much blame has been placed on the quality of instruction, but poor Math performance is evident in both private and public schools, where the former is expected to have better quality teaching. It is difficult to convincingly argue that Math intensive employment are highly rewarded in Guyana, since this should be reflected in higher passing rates for Mathematics, *ceteris paribus*. There are significant economic rewards for students that perform well in quantitative areas in Asia, and this is transformed into a highly Math competent society. The same holds for Finance in North America and Europe. To put it plainly, payoff structures in Guyana are not aligned with Math intensive employment.

The Economist magazine published an article ([Economist \(2015\)](#)) titled: “It depends on *what* you study, not where,” which explains that engineers and computer scientists earn higher wages as compared to those who study Arts and Humanities. The study was conducted by Payscale, a research firm that gathered data from 240 US based institutions over the period 2012-13. Fareed Zakaria has written in defense of a Liberal Arts education ([Zakaria \(2014\)](#)) and argues that the obsession with STEM education at the expense of Arts and Humanities can potentially harm future growth and human development. Zakaria explains that a Liberal Arts education teaches one how to write and think clearly and that these are as important as Science and Technology. But in Guyana’s case, the evidence illustrates that the economy is trapped in a cyclical pattern that reinforces a Liberal Arts education at the expense of STEM education and this can potentially harm future growth.

Since the majority of University of Guyana graduates (*UOGG*) are enrolled in Social

Science programs,  $UOGG$  is used as a proxy measure for rent seeking — this approach is consistent with the literature (Murphy and Vishny (1991) and Murphy and Vishny (1993)). We interpret increases in  $UOGG$  as increases in rent seeking, therefore, we expect the present distribution of  $H_K$  to reduce economic growth after controlling for other growth covariates. We differentiate between the allocation of  $H_K$  and the growth of  $H_K$ , which can be proxied by population growth, migration, secondary school enrollment, fertility rate and life expectancy.

Figure 8 illustrates the partial correlation between GDP per capita and  $UOGG$  for the period 1967-2011. Based on the theoretical analysis advanced and the evidence presented, we expect an inverse relationship — contrary to prevailing theory. Indeed, the *preliminary* evidence supports our theory. To ensure that this partial relationship is not spurious, we tested for unit roots and found the series to be  $I(1)$  integrated. The inverse relationship shown is robust in the sense that it holds when the series are stationary or differenced. To ensure that this is not an accidental result, the partial correlations for the growth of  $H_K$  and GDP per capita were determined. Unsurprisingly, all the conventional relationships hold, that is, the growth of human capital enhances economic performance. On consideration of space, these results were not reported but can be easily reproduced using data from the World Development Indicators. As explained earlier, the story does not end here, what matters for growth is the allocation of  $H_K$  and the evidence shows that this is inefficiently allocated in Guyana.

Conclusive evidence requires a fully specified growth model of the sort shown in (7). It is important to note that Singh (2013) undertakes an econometric analysis to establish the long-term determinants of growth in Guyana and among other things, finds that  $UOGG$  reduces growth. This variable was significant at the 10% level. However, this finding was not analytically helpful since it accompanied peculiar results that went unexplained. For instance: Singh concludes that the internal contest for political control discourages investment and inevitably reduces growth. But within the econometric specification, private investment was negative and insignificant and this finding was robust to various specifications. Based on this result, political contestation that reduces investment should increase growth. This is contrary to the well established relationship between investment and growth.

Additionally, mortality rates were positive and significant at the 1% level; this finding was also robust to various specifications. But this result is counterintuitive. Notwithstanding these, Singh does attempt to explain the negative relationship between  $UOGG$  and growth. He argues that it is either an indication of poor quality education or a mismatch between

tertiary education and the skills and training that firms demand. The latter explanation hints at the inefficient allocation of  $H_K$ .

## 5 A Brief Discussion

Over the years, the University of Guyana has been plagued with financial troubles — delayed payment of electricity bills, staff salaries and pension benefits etc. Although the University is a public institution, the Government of Guyana (*GOG*), like most governments, is reluctant to increase funding. Recently, the *GOG* and the University's administration have taken a decision to increase tuition fees starting from the academic year 2014/15. Proponents of the tuition increase contend that this will cover the University's operating deficit, enhance quality and improve the overall services offered to students. Within this wave of change, a rationalization program looms over the University, many programs are in grave danger of cancellation — see [Figure 6](#). These reforms are intended to cut costs, improve quality and make the University financially sustainable. But if these reforms are implemented, the University of Guyana will specialize in Social Science programs and as the evidence indicates, a specialization in Social Science will reduce growth and cement Guyana's *rentier* economic structure.

A striking parallel exists between these reforms and the structural adjustments undertaken by many Latin American countries in the late 80s and early 90s. These reforms also came in the name of enhanced efficiency and growth. The cumulative consequences are well known but among the most important is the loss of knowledge that accompanied the massive waves of de-industrialization. The programs that are under threat of rationalization produce the type of knowledge that is most often scarcely provided. An important lesson learned from the structural adjustment period is that knowledge is easy to lose but hard to gain. The University of Guyana is badly in need of reform but its current reform program needs a fundamental rethink. Still, reforming the University in a rentier economic structure will not produce beneficial results. Unless the economy requires a growing number of non-social science related skills, these will be under-provided. Industrial policies and rent management systems become essential to change the rentier structure.

Joseph Stiglitz in his commentaries on the state of the US economy contends that the American society is experiencing a structural transformation towards services, and since markets are not particularly helpful in these transitions, crises are likely. To put this more

precisely, the US economy is cementing its rentier economic structure with gross implications for the allocation of its  $H_K$ . The adverse implications of this are best depicted by the recent financial crisis. While the stock markets have recovered and the interests of the rentier class secured, unemployment in the US remains unacceptably high. Any economic recovery must move in tandem with a change in the size and influence of the rentier economy, otherwise, the cycle of rentierism will persist along with rising inequality and poor growth. Similarly, one of the great impediments to sustainable growth in Guyana is its rentier economy and its corresponding inefficient allocation of  $H_K$ .

## 6 Conclusion

This article advances a simple thesis — that the allocation of human capital between entrepreneurship and rent seeking is the fundamental determinant of the growth implications of human capital. Unlike the literature on institutions and the allocation of talent, we argue that it is economic structures that determine the relative payoff structures between rent seeking and entrepreneurship. For instance, in largely agrarian economies, the dynamics of the labour market produces human capital to reinforce the agrarian economic structure — changes in the dynamics of the labour market are the consequences of structural change. Further, we illustrate that a given allocation of human capital is a stable equilibrium, thus, if human capital is inefficiently allocated; market dynamics will not correct this misallocation. This argument justifies industrial policies to promote growth enhancing structural dynamism.

We study the case of Guyana and arrive at supporting but preliminary evidence. The latter shows that the given allocation of human capital does indeed reduce economic growth in Guyana. At one level, this is an indirect measure of the economic consequences of Guyana's economic structure. But conclusive evidence requires a battery of empirical tests that are left for future work. Still, we can draw a number of preliminary policy implications.

Tuition fees at the University of Guyana can be used as an allocating tool — higher tuition fees for programs that are considered less important for the national interest and free or low cost tuition for the programs that are severely under attended and are of national importance. But competencies in Mathematics, English and Science at the high school level need to increase, otherwise, the tuition fee strategy will be inadequate. More fundamentally, Guyana needs to upgrade the skills intensity of its economy. This involves developing high-luxury



tourism products, capitalizing on the agricultural market in the Caribbean and technological upgrading of key commodities etc. Nothing short of coherent industrial strategies at the sectoral levels are required.

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**Figure 1:** Firm Size, Rent-Seeking,  $\dot{K}(t)$  and the Allocation of  $H_K$

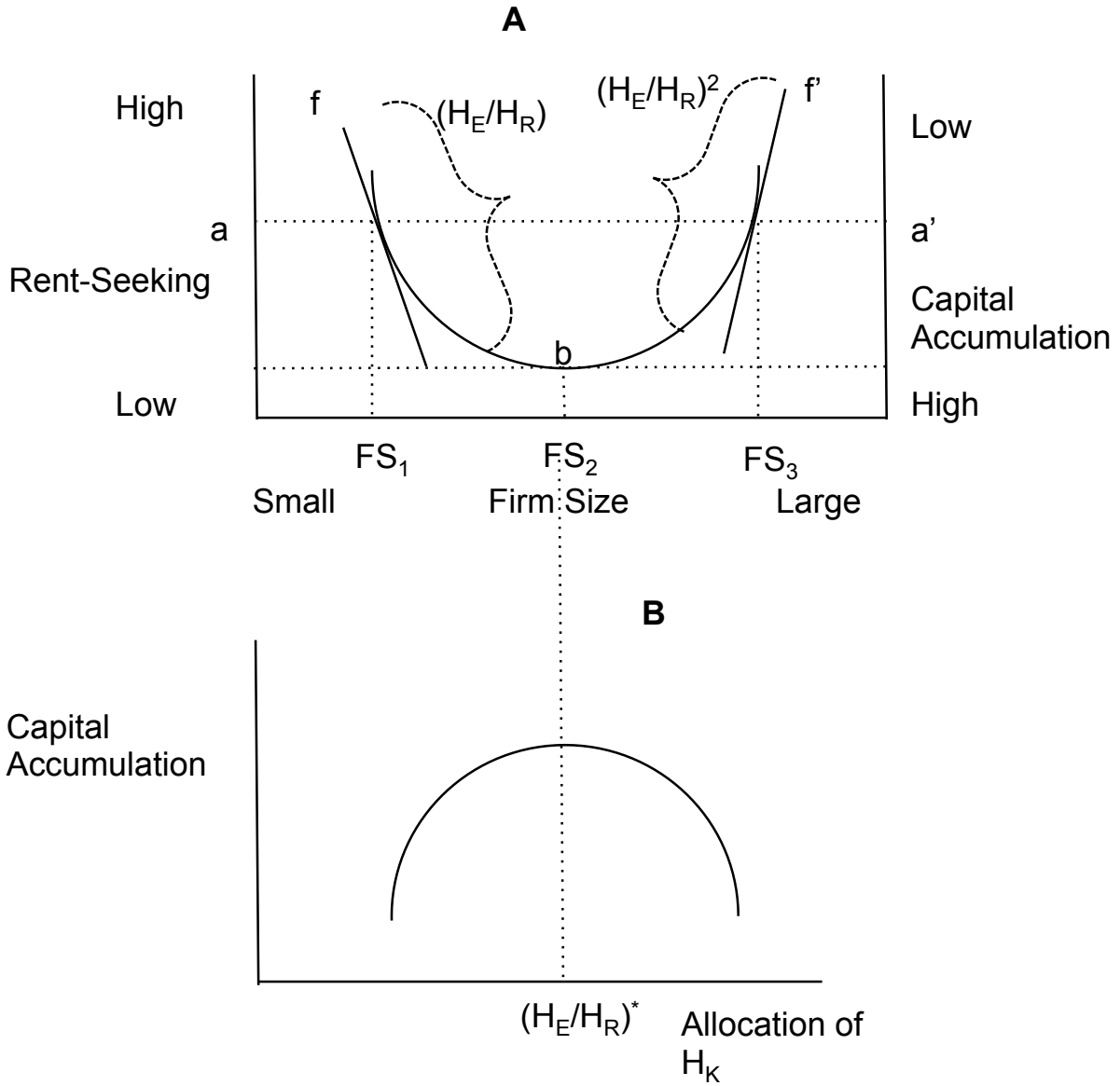
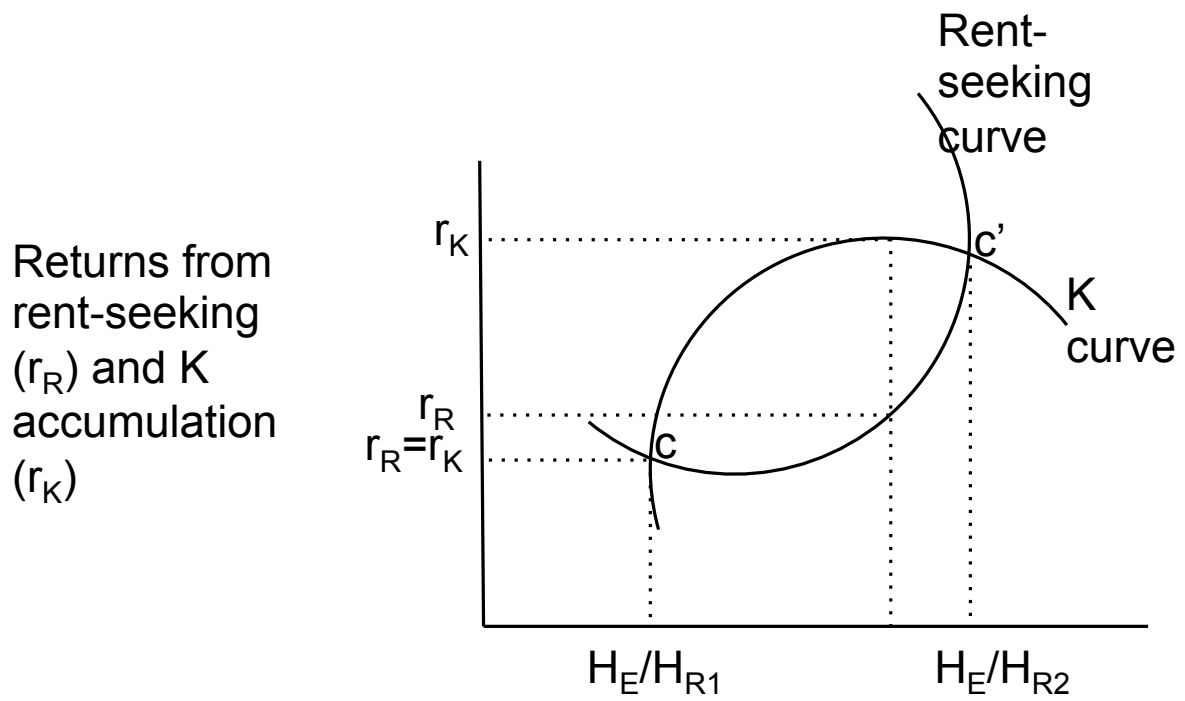
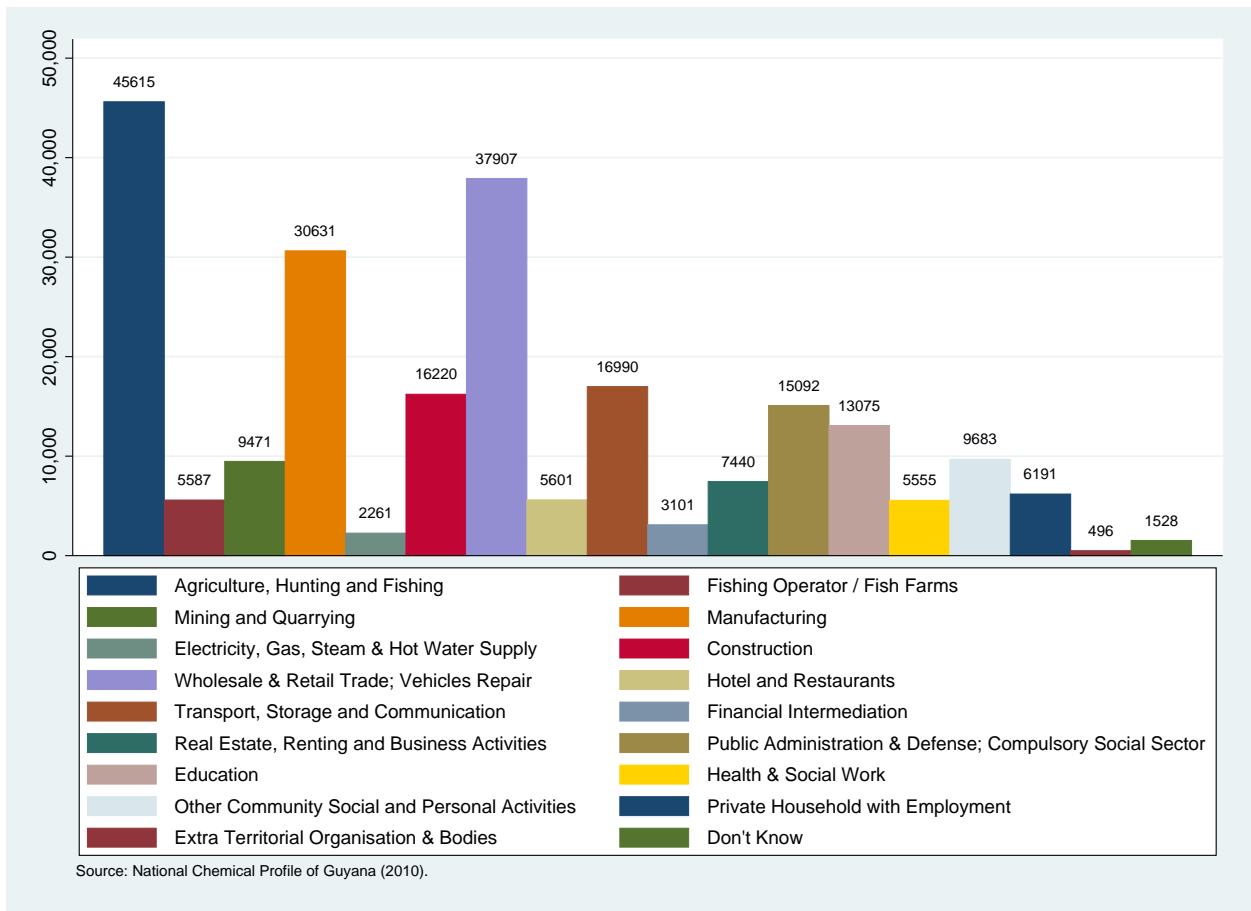


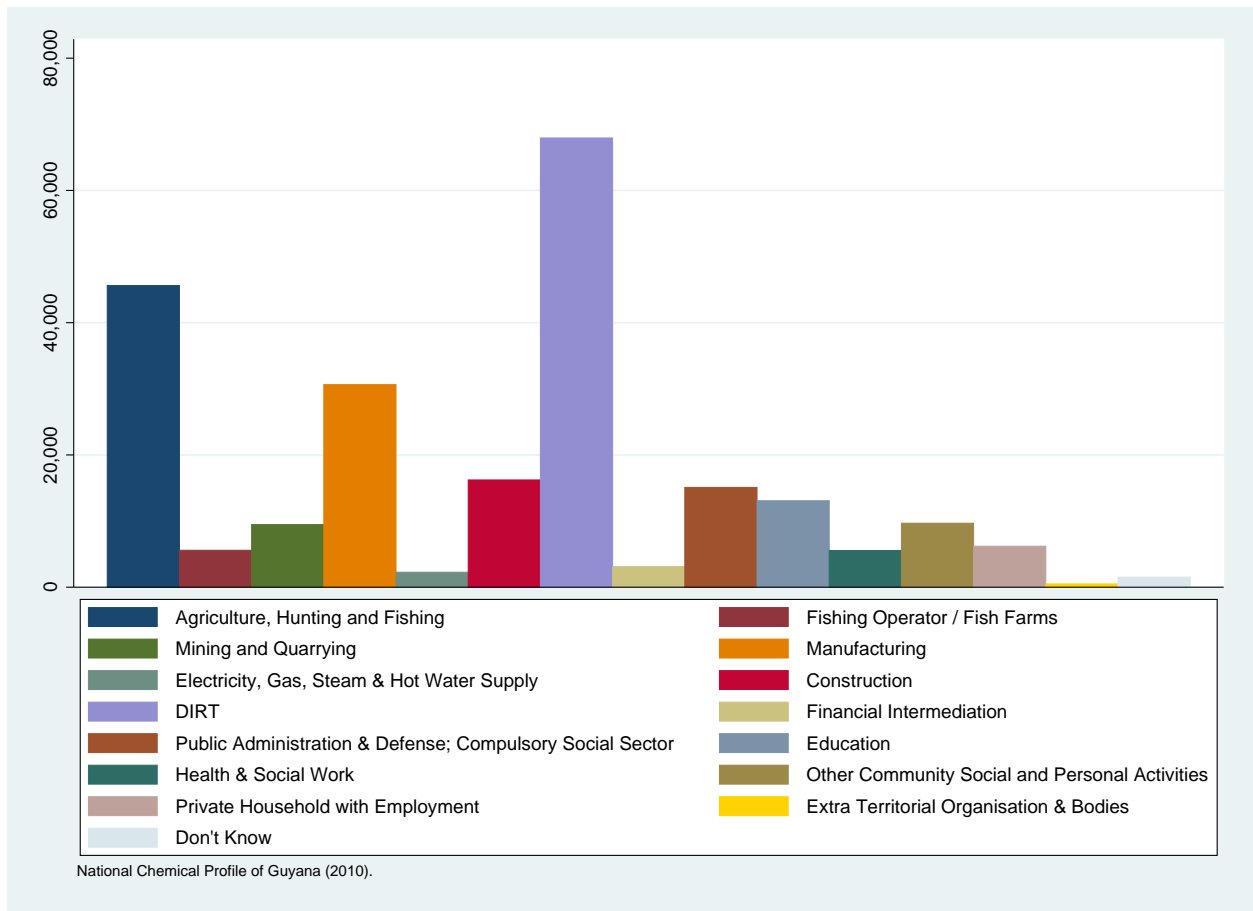
Figure 2: Allocation of  $H_K$  and Multiple Equilibria



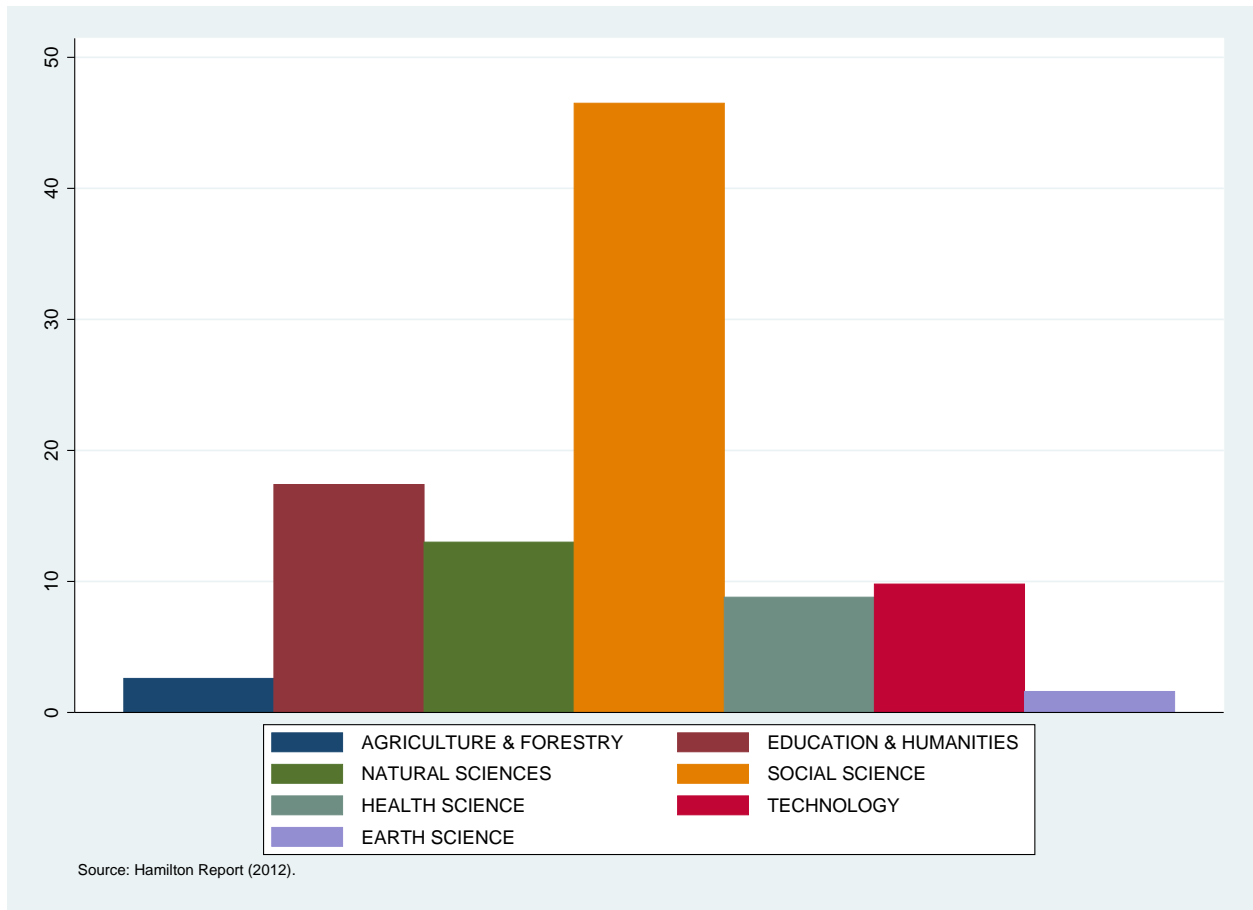
**Figure 3: Employment by Major Industry in Guyana**



**Figure 4:** Employment by Major Industry in Guyana including the *DI<sub>n</sub>RT* Sector



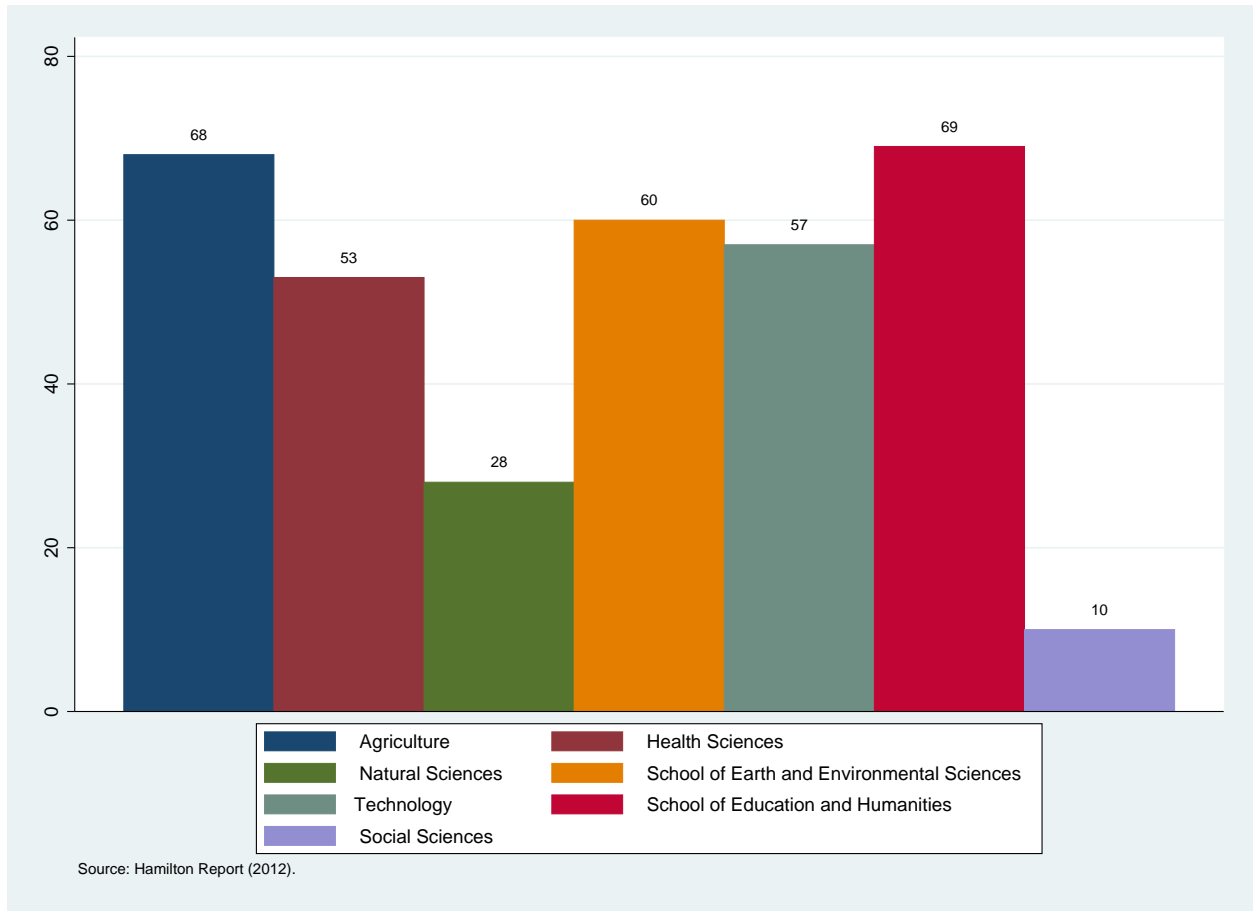
**Figure 5:** Distribution of Students by Faculty (%): 2009/10



*Notes:* Hamilton, T and Associates. 2012. Enhancement of the Regulatory Framework for the Improvement of Operations at the University of Guyana: Structures and programs for efficiency and effectiveness, competencies and income diversification. Report prepared for the University of Guyana.

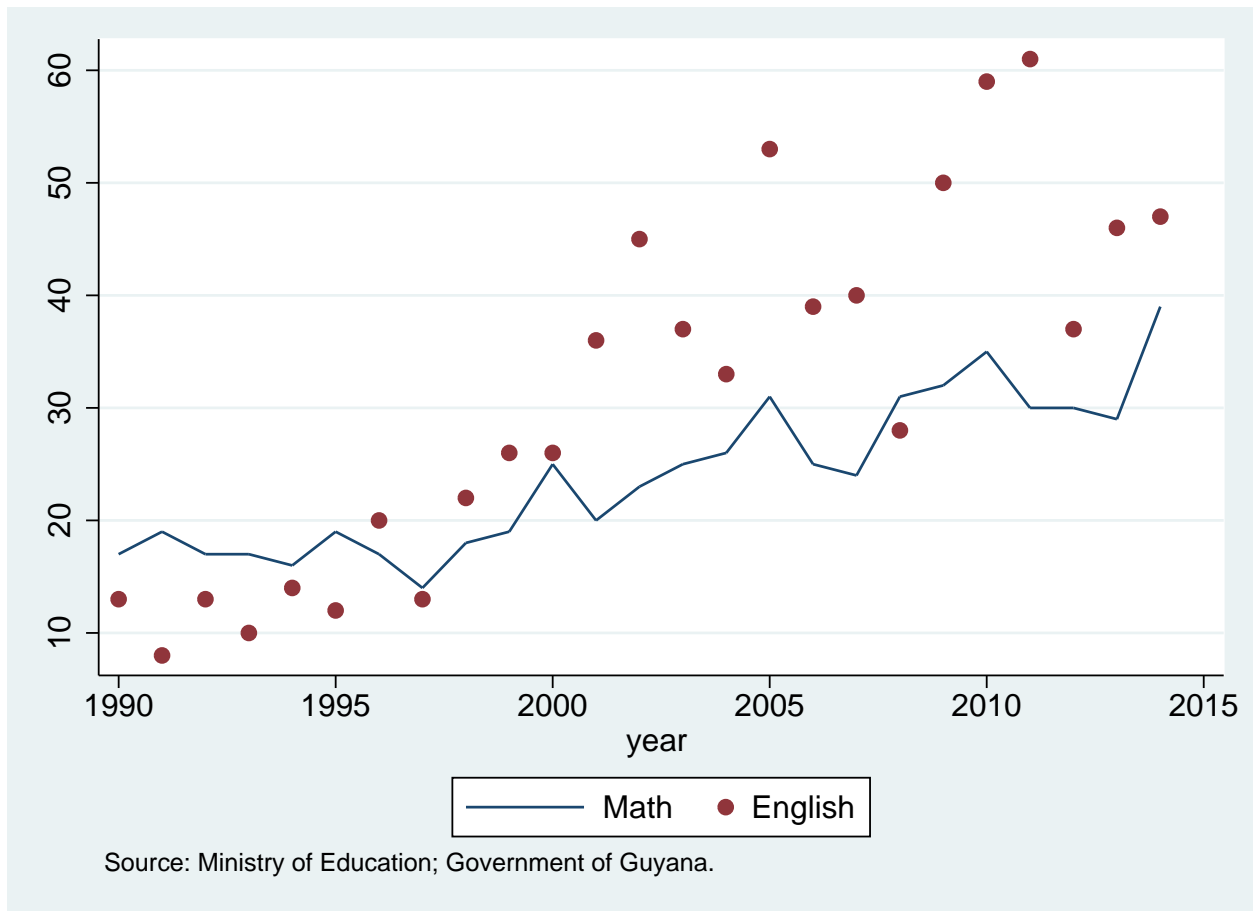


**Figure 6:** Courses with less than 15 Students per Faculty (%): 2011

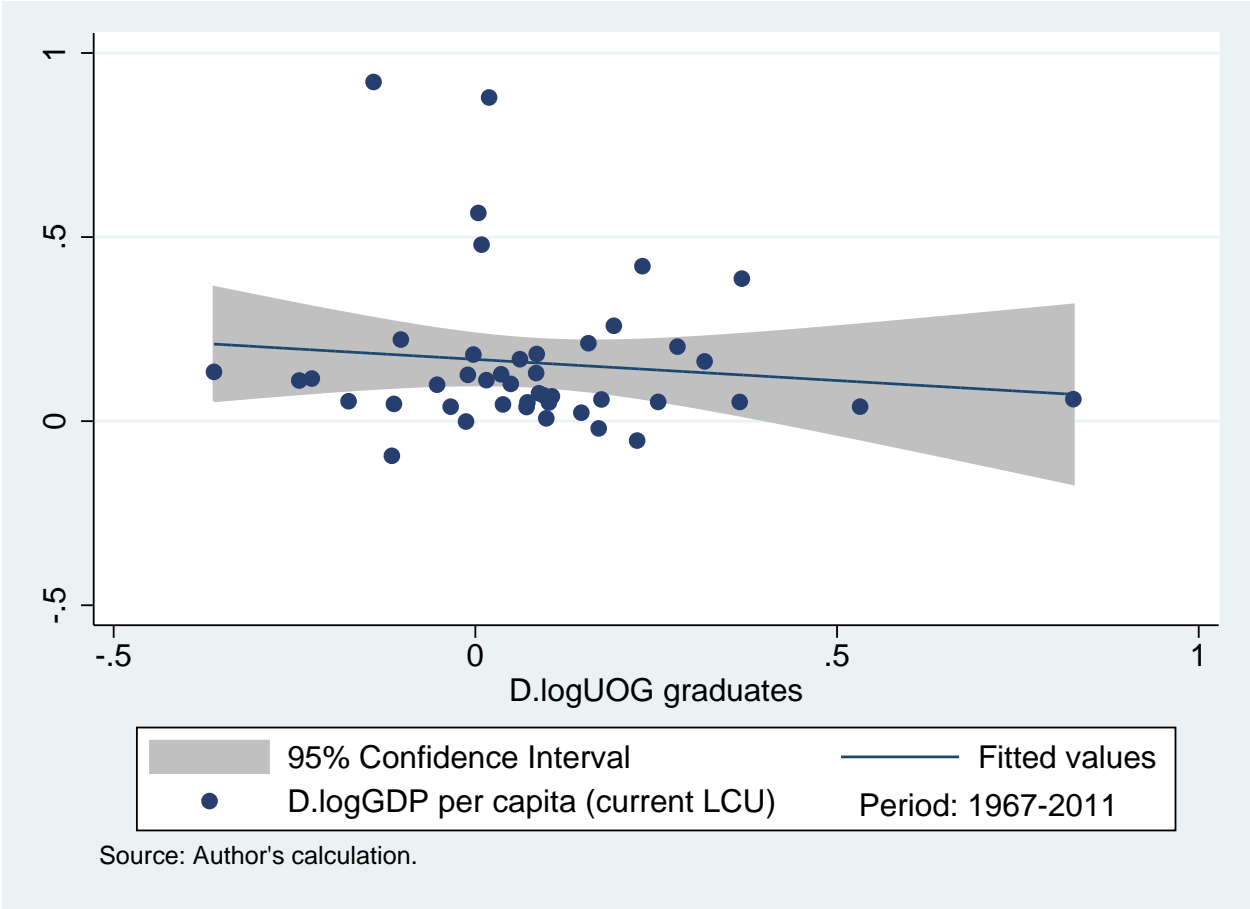


*Notes:* Hamilton, T and Associates. 2012. Enhancement of the Regulatory Framework for the Improvement of Operations at the University of Guyana: Structures and programs for efficiency and effectiveness, competencies and income diversification. Report prepared for the University of Guyana.

**Figure 7:** Passing Rates for High School Students (%)



**Figure 8:** Partial Correlation: GDP Per Capita and UOG Graduates



*Notes:* The data sources are World Development Indicators and University of Guyana. Both series are I(1) integrated and thus, expressed in first differences. Also, the series are logged to capture their rates of change.