

Creative Capital Accumulation and the Advancement of India's Creative Economy¹

by

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Abstract

Despite the relevance of Richard Florida's ideas about the role of *creative capital* in promoting the creative economy of developing nations like India, there is *no* theoretical research on these topics in the extant literature. Therefore, we focus on an arbitrary region in a developing country and then analyze the creative capital accumulation decision faced by workers in this region who aspire to membership in the so called *creative class*. Specifically, we compute the present discounted value of a worker's lifetime earnings as a function of the primitives of the problem. Next, we solve for the level of education that maximizes the lifetime earnings function. Finally, we describe how this optimal level of education is affected by changes in the lifespan of workers, the interest rate, and by the growth rate of the wage function.

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1. Introduction

Since the publication of Richard Florida's two books *The Rise of the Creative Class* in 2002 and *The Flight of the Creative Class* in 2005, there has been great interest among economists and regional scientists in studying the twin concepts of the *creative class* and *creative capital*. Florida (2002, p. 68) clearly points out that the creative class "consists of people who add economic value through their creativity." This class consists of professionals such as doctors, lawyers, scientists, engineers, university professors, and, notably, bohemians such as artists, musicians, and sculptors. What makes these people noteworthy is that they possess creative capital which is defined to be the "intrinsically human ability to create new ideas, new technologies, new business models, new cultural forms, and whole new industries that really [matter]" (Florida, 2005, p. 32). According to Florida, the creative class is important because this group generates ideas, information, and technology, outputs that are salient for the growth of cities and regions. Therefore, cities and regions that want to succeed in the global arena need to do all they can to attract members of this creative class because this class is the primary driver of economic growth.

One important question that now arises is the following: What is the difference between creative capital and the more familiar notion of human capital? There is some dispute on this basic question in the literature. On one hand, Glaeser (2005) has argued that there is little or no difference between the concepts of creative and human capital. On the other, Marlet and Van Woerkens (2007) have argued that the notion of creative capital is a *broader* concept than the notion of human capital. Now, in empirical research, the notion of human capital is routinely measured with education or with education based indicators. The key point to grasp here is that although Florida's creative class possesses creative capital, as noted by Marlet and Van Woerkens (2007), the accumulation of

creative capital does *not* always depend on the acquisition of formal education. In other words, while the creative capital accumulated by some members of Florida’s creative class such as doctors, engineers, and university professors, clearly is a function of the completion of many years of formal education, the same is not always true of other members of this creative class such as artists, painters, and poets. Individuals in this latter group may be innately creative and therefore possess creative capital despite having completed very little or no formal education.

Given this state of affairs, we contend—like Marlet and Van Woerken (2007)—that there is little or no difference between the notions of human and creative capital when the accumulation of this creative capital possessed by doctors, engineers, etc., is a function of the completion of many years of formal education. In contrast, there can be a lot of difference between the notions of human and creative capital when the accumulation of this creative capital possessed by artists, sculptors, etc., does not have to depend on the completion of a formal education. Since creative capital is of two types, it is a more general concept than the notion of human capital.⁴

Richard Florida’s ideas about creative capital and the creative class have become very popular in North America and in Western Europe and hence there is now a substantial literature in urban economics and regional science on the usefulness of these ideas in comprehending the economic growth and development of cities and regions in these parts of the world.⁵ However, as noted by Florida (2006), in this era of globalization, the ability of India to compete effectively in the

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In this paper, we shall think of creative capital mainly as a kind of capital that can be accumulated by obtaining a formal education. Even so, we recognize that it is also possible to be innately creative, i.e., to possess creative capital without obtaining a formal education.

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For a more detailed corroboration of this claim, see McGranahan and Wojan (2007), Nathan (2007), Florida et al. (2008), Andersen et al. (2010), Batabyal and Nijkamp (2010), Hatcher et al. (2011), Gabe et al. (2013) Sands and Reese (2013), and the many references cited in these studies.

world economy depends crucially on the advancement of its *creative economy*. In this regard, Florida (2006) and the *Economic Times* (Anonymous, 2013a) note that New Delhi is India's most creative region but that in 2004, only three city-regions—Bangalore, Hyderabad, and New Delhi—produced almost all of the technological innovations in India for which United States patents were granted.

A recent study (Anonymous, 2013b) conducted by the Martin Prosperity Institute at the University of Toronto⁶ in Canada provides a detailed discussion of several aspects of the creative economy in India. Three points from this study are worth emphasizing. First, in order establish a robust creative economy, India will need to focus on the 3Ts, namely, talent, technology, and tolerance. Second, since the creative class is largely responsible for generating new and creative ideas that support economic growth, India will need to increase the proportion of its workforce that comprises the creative class from the present low level of 14%. Finally, since the acquisition of a formal education leads to the possession of creative capital and creative capital is embodied in talented workers who comprise the creative class, India will need to substantially increase the creative capital possessed by its workforce. Put differently, India will need to greatly raise the number of its citizens over age 25 who hold a Bachelor's or higher degree from the present low figure of 4.1%.⁷

Despite the salience of the above three points for sustained growth and continued prosperity in India, with one exception, there are no *theoretical* studies that explicitly model the talent

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Richard Florida is presently the director of the Martin Prosperity Institute at the University of Toronto.

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With regard to India, these points have also been alluded to by Bhatia and Dash (2010). The reader should note that these points are pertinent even in the developed economies of the West. See Jayne (2005), Malecki (2007), and Warrington (2008) for a more detailed discussion of this claim.

acquisition process by workers.⁸ Given this lacuna in the literature, our objective in this paper is to formally study the creative capital accumulation decision faced by workers in an arbitrary region in a nation such as India. The rest of this paper is organized as follows. Section 2 delineates our theoretical framework. Section 3 analyzes the creative capital accumulation decision faced by workers in the above mentioned region by computing the present discounted value of the lifetime earnings of these workers as a function of the primitives of the problem. Section 4 solves for the level of education that maximizes the aforementioned lifetime earnings function. Section 5 describes how this optimal level of education is affected by changes in the lifespan of workers, the interest rate, and by the growth rate of the wage function. Section 6 concludes and then discusses two ways in which the research in this paper might be extended.

2. The Theoretical Framework

Our model is adapted from Bils and Klenow (2000).⁹ Consider a regional economy that is creative in the sense of Richard Florida. This region produces a single final consumption good such as a knowledge good with two factors of production, namely, physical and creative capital. The price of this single final consumption good is normalized to unity at all time points. The stock of creative capital at any time t can also be thought of as the total amount of productive services supplied by workers in the region under study. Looked at in this way, this stock represents the aggregate total contribution of workers with different skill levels to the production of output. Therefore, consistent with Florida's description of creative capital described in section 1, this stock of creative capital

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Batabyal and Nijkamp (2010) is the only paper to have theoretically studied aspects of the creative capital accumulation decision. However, we stress that the model and the methods employed in this paper are very different from the model and the methods we utilize in the present paper.

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See Romer (2012, pp. 150-188) for a very readable textbook account of similar modeling frameworks.

includes the contributions of individuals who are innately creative with little or no formal education and particularly those who are creative by virtue of having acquired this creativity through the pursuit of a formal education.

The accumulation of creative capital in the region under study depends on the production function for creative capital and on the quantity of resources devoted to creative capital accumulation. With regard to the production function aspect of creative capital generation, we suppose that each worker's creative capital depends on his or her years of education. With regard to the quantity of resources devoted to the accumulation of creative capital, we assume that the allocation of resources to this accumulation process is exogenous. Each worker in the region under study obtains the same level of education and we focus our attention on the case in which this level is time invariant. These last two assumptions ensure the tractability of the mathematical analysis below.

Consider a worker in our regional economy who is born at time $t=0$ and whose lifespan equals T years.¹⁰ This worker enrolls and stays in school acquiring a formal education for the next E years of his life. Then, having acquired the necessary creative capital, this worker is employed as a member of the creative class for the next $T-E$ years. Specifically, the wage at any time t or $w(t)$ of a worker with education E is given by

$$w(t) = \beta e^{gt} e^{\lambda E}, \quad (1)$$

where β , g , and λ are positive constants. The constant β can be thought of as a constant of proportionality. The constant g denotes a growth rate which arises from the empirical observation

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Uncertainty about the lifespan of workers can be modeled by considering the expectation of the present lifespan T .

that additional time spent in school tends to increase an individual's wage. Similarly, the constant λ denotes the strength of a marginal increase in education on a worker's wage. Finally, let r denote the constant interest rate in our regional economy. This completes the description of the theoretical framework. Our next task is to formally analyze the creative capital accumulation decision faced by workers in the region under study. We do so by computing the present discounted value of the lifetime earnings of these workers as a function of the primitives of the underlying problem.

3. The Creative Capital Accumulation Decision

The present discounted value, at time $t=0$, of a worker's lifetime earnings in our region is given by

$$I = \int_{t=E}^{t=T} e^{-rt} w(t) H(t) dt, \quad (2)$$

where $H(t)$ denotes the total number of workers. Without loss of generality, let us normalize $H(t)$ to one. Then, using the wage function in (1) to substitute for $w(t)$ in (2), we get

$$I = \int_{t=E}^{t=T} e^{-rt} \beta e^{gt} e^{\lambda E} dt. \quad (3)$$

Bringing the constant term $\beta e^{\lambda E}$ outside the integral, (3) can be simplified to

$$I = \beta e^{\lambda E} \int_{t=E}^{t=T} e^{-(r-g)t} dt. \quad (4)$$

Solving the integral in (4), we get

$$I = \beta e^{\lambda E} \left[\frac{-1}{r-g} \right] e^{-(r-g)t} \Big|_{t=E}^T = \frac{\beta e^{\lambda E}}{r-g} \{ -e^{-(r-g)T} + e^{-(r-g)E} \}. \quad (5)$$

Equation (5) can be written more compactly as

$$I = \frac{\beta}{r-g} [-e^{\lambda E - (r-g)T} + e^{\{\lambda - (r-g)\}E}]. \quad (6)$$

Equation (6) gives us the closed-form expression we seek for the present discounted value of the lifetime earnings of workers who are acquiring creative capital and thereby eventually becoming members of the creative class in the region under study. Inspection of (6) shows that the desired expression for the lifetime earnings is a function of β , λ , g , r , E , and T which are the primitives of the problem. We now proceed to solve for the level of education that maximizes the lifetime earnings function given in (6).

4. Optimizing the Lifetime Earnings Function

Maximizing the right-hand-side (RHS) of (6) with respect to the non-negative choice variable E gives us the first order necessary condition for an optimum. That condition is

$$\frac{\partial I}{\partial E} = \frac{\beta}{r-g} [-\lambda e^{\lambda E - (r-g)T} + \{\lambda - (r-g)\} e^{\{\lambda - (r-g)\}E}] = 0. \quad (7)$$

Equation (7) can be re-written as

$$\{\lambda - (r-g)\} e^{\{\lambda - (r-g)\}E} = \lambda e^{\lambda E - (r-g)T}. \quad (8)$$

Dividing both sides of (8) by $e^{\lambda E}$ and then rearranging terms gives us

$$e^{-(r-g)(E-T)} = \frac{\lambda}{\lambda - (r-g)}. \quad (9)$$

Let us now take the natural logarithm of both sides of (9). This yields

$$-(r-g)(E-T) = \ln\left\{\frac{\lambda}{\lambda - (r-g)}\right\}. \quad (10)$$

The final step is to first divide both sides of (10) by $-(r-g)$ and to then add the lifespan of workers or T to both sides of the resulting expression. This twofold process gives us the maximizing value of education E^* that we seek. Specifically, this value is

$$E^* = T - \frac{1}{r-g} \ln\left\{\frac{\lambda}{\lambda - (r-g)}\right\}. \quad (11)$$

Is it possible that the creative class in the region under study will consist only of people who are innately creative because it is never optimal to become creative by pursuing a formal education?

Put differently, what we want to know is whether it is possible for the optimal level of education E^* to equal zero. Manipulating (11) we see that in order for E^* to optimally be zero, we must have $e^{(r-g)T} = \lambda / \{\lambda - (r-g)\}$. In any practical scenario, it is difficult to see why this condition would hold except by some fluke. Hence, we conclude that pursuing no formal education is unlikely to be an optimal course of action in the region under study.

Next, we consider the other extreme possibility. That is, we ask whether it is possible for E^* to equal the lifespan of workers in the region under study. In other words, we are now asking whether it is optimal to become creative by pursuing a formal education for all of one's life. Once again, manipulating (11), we find that it is optimal to be in school pursuing an education for all of one's life if and only if $r=g$. However, if $r=g$ then, inspecting (6), we see that the problem of creative capital accumulation that we are studying becomes mathematically ill posed and ceases to have economic meaning. Therefore, we rule this possibility out as well and conclude that consistent with our intuition in this matter, it is never optimal to be pursuing a formal education (accumulating creative capital) for all of one's life. We now perform three comparative statics exercises and show how the optimally accumulated level of education given in (11) is affected by changes in the lifespan of workers (T), the interest rate (r), and by the growth rate (g) in the wage function. Note that consistent with the above discussion, these three exercises make sense only when $r \neq g$ and hence we suppose that this last condition holds.

5. Comparative Statics

We begin by focusing on the effect of an *increase* in the lifespan T on E^* . Differentiating the expression for E^* in (11) with respect to T we get

$$\frac{\partial E^*}{\partial T} = 1. \quad (12)$$

The clear implication of (12) is that an increase in the lifespan of workers in our creative region *raises* the optimal level of education on a one-for-one basis. From an intuitive standpoint, this result makes sense because an increased lifespan provides for a longer period of employment over which one can receive the higher wages that result from the pursuit of more education.

Next, let us consider the impact of a *rise* in the interest rate r and the growth rate g in the wage function. Inspecting (11), we see that r and g enter the optimal level of education E^* through the $(r-g)$ term. Now before we formally demonstrate the impacts of a rise in these two parameters on the optimal level of education E^* , let us first think through the underlying effects intuitively. When r increases, the term $(r-g)$ also increases and this increase causes workers in our creative region to select *less* education. To see why, note that acquiring a little more education today means that one foregoes current earnings for higher future earnings. However, a higher interest rate means that the higher future wages due to a higher level of education will be worth less today (in present value) and this is why workers select less education.

We show this above result by taking the reciprocal of both sides of (9) and then simplifying the result. This gives us

$$1 - e^{-(r-g)(T-E^*)} = \frac{r-g}{\lambda}. \quad (13)$$

Next, we multiply both sides of (13) by $\lambda/(r-g)$. This yields

$$\frac{\lambda}{r-g} = \{1 - e^{-(r-g)(T-E^*)}\} = 1. \quad (14)$$

The left-hand-side (LHS) of (14) can be written as

$$W \equiv \lambda \int_{u=0}^{u=T-E^*} e^{-(r-g)u} du. \quad (15)$$

Now, totally differentiating (14), we get

$$\frac{\partial W}{\partial(r-g)} d(r-g) + \frac{\partial W}{\partial E^*} dE^* = 0, \quad (16)$$

and hence we obtain

$$\frac{dE^*}{d(r-g)} = -\frac{\partial W/\partial(r-g)}{\partial W/\partial E^*}. \quad (17)$$

Some thought tells us that

$$\frac{\partial W}{\partial(r-g)} = \lambda \int_{u=0}^{u=T-E^*} -ue^{-(r-g)u} du < 0. \quad (18)$$

Similarly, we get

$$\frac{\partial W}{\partial E^*} = -\lambda e^{-(r-g)(T-E^*)} < 0. \quad (19)$$

Using the results from (18) and (19) in (17), it is clear that

$$\frac{dE^*}{d(r-g)} < 0. \quad (20)$$

From (20), we see that a *rise* in the interest rate r *lowers* the optimal level of education E^* in our creative region. In contrast, an increase in the growth rate in the wage function g *raises* the optimal level of education E^* . Now, if we maintain that an increase in formal education increases one's creativity then the above result says that, *ceteris paribus*, as the interest rate r and hence the term $(r-g)$ rises, workers choosing to pursue a formal education will become *less* creative. This completes our three comparative statics exercises.

5. Conclusions

In this paper, we noted that despite the relevance of Richard Florida's ideas about the role of creative capital in promoting the creative economy of developing nations like India, there was no theoretical research on these topics in the extant literature. Therefore, we concentrated on an arbitrary region in a developing country and then analyzed the creative capital accumulation decision faced by workers in this region who aspired to membership in the so called creative class. In particular, we computed the present discounted value of a worker's lifetime earnings as a function of the primitives of the underlying problem. Next, we solved for the level of education that maximized the lifetime earnings function. Finally, we described how this optimal level of education was affected by changes in the lifespan of workers, the interest rate, and by the growth rate in the wage function.

The analysis in this paper can be extended in a number of different directions. In what follows, we suggest two possible extensions. First, it would be useful to analyze a model in which the wage function—see (1)—explicitly accounts for the experience of workers. Second, following the work of Oladi and Beladi (2008), it would be useful to ascertain how the creative capital accumulation decision is affected by the presence of trade between two or more regions in a developing country such as India. Studies that analyze these aspects of the problem will provide additional insights into the nexuses between the acquisition of creative capital and the working of creative economies.

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