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Abstract

We study aspects of economic growth in a region that is creative in the sense of Richard Florida. Members of the creative class fall into one of two possible groups. This grouping stems from the manner in which creative capital is acquired by the individual members. In this setting, we accomplish five tasks. First, we derive the wage of members in each of the two creative class groups. Second, we show that the average wage increases with the physical capital per creative class member ratio. Third, we derive an expression for the steady state physical capital per creative class member ratio. Fourth, we show that in a particular circumstance, the distribution of income does not affect the steady state physical capital per creative class member ratio. Finally, we ascertain the optimal income redistribution rule that maximizes the average steady state income of the creative class in the region under study.

Keywords: Creative Capital, Creative Class, Economic Growth, Income Redistribution, Region

JEL Codes: R11, D90

1. Introduction

There is no gainsaying the fact that in the last two decades, the twin concepts of the *creative class* and *creative capital* have aroused great research interest among both regional scientists and urban economists. According to Richard Florida (2002, p. 68), 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. The distinguishing feature of these people 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).

Florida (2014) contends that the creative class is significant because this group of people gives rise to ideas, information, and technology, outputs that are very important for the growth of cities and regions. Therefore, cities and regions that want to succeed in the global arena need to make a concerted attempt to attract and retain members of this creative class who are, we are told, the primary drivers of economic growth.

Is there any difference between the well-known concept of human capital and Florida's newer notion of creative capital? To answer this question, first observe that in empirical work, the notion of human capital is generally measured with education or with education based indicators. Even so, Marlet and Van Woerkens (2007) have rightly pointed out that the accumulation of creative capital does *not* always depend on the acquisition of a formal education. In other words, while the creative capital accumulated by some members of Florida's creative class (doctors, engineers, university professors) does depend on the completion of many years of formal education, the same is not always true of other members of this creative class (artists, painters, poets). Individuals in this latter group may be innately creative and hence possess creative capital despite having very little or no formal education.

As such, we agree with Marlet and Van Woerkens (2007) and note that there is little or no difference between the notions of human and creative capital when the accumulation of this creative capital depends on 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 does not have to depend on the completion of a formal education. Because creative capital is of two types, it is a *more general* concept than the notion of human capital.

A review of the contemporary literature on the creative capital possessing creative class yields two straightforward conclusions. First, there exist many studies on the composition and the impacts of the creative class in alternate regions. However, these studies typically are either empirical in nature or based on case studies.[4] Second, a smaller set of studies has focused on the connections between the creative class in a region and economic growth in this same region but these studies also are empirical in nature.

For instance, Boschma and Fritsch (2009) utilize a data set that covers more than 500 regions in seven European nations and show that there is some evidence of a positive relationship among creative class occupation, employment growth, and entrepreneurship at the regional level. Marrocu and Paci (2012) concentrate on 257 regions in the European Union and demonstrate that highly educated people working in creative occupations are the most pertinent component in explaining production efficiency and that bohemians have little impact on a region's economic performance. Finally, Kerimoglu and Karahasan (2014) focus on Spain and

[4] See Arribas *et al.* (2015), Donegan and Lowe (2008), Florida *et al.* (2008), Liu and Xie (2013), Lorenz (2011), Reese and Sands (2008), and Siemiatycki (2013) for a more detailed corroboration of this claim.

point out that the notion of creative capital and particularly its local spillover has a salient impact on regional income gaps in Spain once other factors such as human and physical capital accumulation have been controlled for.

A key point is now worth emphasizing. Although there exist many empirical or case study based analyses of the creative class and the impact that this class has on regional economic growth, there are *no* theoretical studies of the creative class that explicitly model the fact that the creative capital possessed by the members of a region's creative class is of *two possible types*. Given this lacuna in the literature, in this paper we provide the *first* formal analysis of economic growth in a region that is creative in the sense of Richard Florida and where members of the creative class belong to one of two possible groups. Consistent with the previously discussed work of Marlet and Van Woerkens (2007), this two-part grouping arises because the creative capital possessed by the individual members is of two possible types.

The remainder of this paper is organized as follows. Section 2 delineates our model of a creative region in detail. Section 3 derives the wage of members in each of the two creative class groups. Section 4 shows that the average wage in the region under study is increasing in the physical capital per creative class member ratio. Section 5 derives an expression for the steady state physical capital per creative class member ratio. Section 6 shows that in a specific circumstance, the distribution of income does not affect the steady state physical capital per creative class member ratio. Section 7 determines the optimal income redistribution rule that maximizes the average steady state income of the creative class. Section 8 concludes and then suggests two ways in which the research described in this paper might be extended.

2. The Theoretical Framework

Consider a dynamic regional economy that is creative *a la* Richard Florida. Time is discrete. Let N_t denote the number of individuals at time t who comprise the creative class in this region. Since all the members of the creative class are employed at all points in time, we can also think of N_t as the total number of workers in our creative region. There are two groups of workers. Without any loss of generality, we shall generically refer to members of the creative class who are innately creative and hence possess creative capital with little or no formal schooling as *artists*. At any time t, the total number of artists in our creative region is denoted by N_t^A. Similarly, we shall broadly refer to the creative class members who are creative as a result of the acquisition of creative capital through many years of formal schooling as *engineers*. Let N_t^E denote the total number of engineers at time t in our creative region. With this specification in place, the reader should note that the relationship

$$N_t = N_t^A + N_t^E, \forall t, \tag{1}$$

holds in our creative region.

Each member of the creative class or worker inelastically supplies one unit of effort. As a result, at any time t, every artist receives a wage or unit income denoted by w_t^A and every engineer receives a wage denoted by w_t^E. Using these two pieces of information and equation (1), we can write

$$N_t w_t = N_t^A w_t^A + N_t^E w_t^E, \forall t, \tag{2}$$

for the economy of our creative region as a whole. Let us denote the wage or unit income ratio in our creative region by $w_t^A / w_t^E = \phi$ where $\phi \in (0, \infty)$ and we can think of ϕ as an income distribution parameter in our creative region. The fraction of artists in the creative class population is assumed to be $\zeta \in (0,1)$ and hence the fraction of engineers in this same population is $(1-\zeta)$. The creative class population grows at a constant rate denoted by $c > 0$.[5]

The members of the creative class collectively produce a knowledge good such as a smartphone that is also the final consumption good. The price of this knowledge good is normalized to unity at all time points. The output of this knowledge good per creative class member at time t is denoted by $q_t = Q_t/N_t$ and this output is generated by a Cobb-Douglas production function which, in its intensive form, can be expressed as

$$q_t = f(k_t) = k_t^{\alpha}, \tag{3}$$

where the parameter $\alpha \in (0,1)$ and $k_t = K_t/N_t$ is the physical capital per creative class member ratio. There are constant returns to scale in production and we suppose that the equilibrium wage and the interest rate (r_t) are set equal to the respective marginal productivities.

The savings rates of the artists and engineers are constants and denoted by λ^A and λ^E respectively. In what follows, without loss of generality, we assume that artists save less than engineers. In symbols, this means that we have

$$0 < \lambda^A < \lambda^E < 1. \tag{4}$$

Finally, the law of motion for the aggregate stock of physical capital in our creative region is given by

$$K_{t+1} = S_t, \tag{5}$$

where S_t denotes the total savings of both artists and engineers when young. This completes the description of our theoretical framework. Our next task is to derive the wages of artists and engineers, the two groups that together comprise the creative class in the region under study.

5 Issues related to the distribution of income in our creative region are discussed in greater detail in sections 3 and 7 below.

3. Wages of Artists and Engineers

We begin by rewriting equation (2) for the average wage (w_t) in our creative economy. We get

$$w_t = \frac{N_t^A}{N_t} w_t^A + \frac{N_t^E}{N_t} w_t^E. \tag{6}$$

Now recall that $N_t^A / N_t = \zeta$, $N_t^E / N_t = (1-\zeta)$, and $w_t^E = w_t^A / \phi$. Using these three expressions, we can rewrite equation (6) as

$$w_t = \zeta w_t^A + (1-\zeta) \frac{w_t^A}{\phi}. \tag{7}$$

After some steps of algebra, equation (7) can be simplified to give us the expression for the wage of artists or w_t^A that we seek. We get

$$w_t^A = \frac{w_t}{\zeta + (1-\zeta)/\phi} = \frac{\phi w_t}{\phi\zeta + (1-\zeta)}. \tag{8}$$

Knowing the wage received by the artists in our region's creative class, we can solve for the wage received by the engineers in this same creative class. We get

$$w_t^E = \frac{w_t^A}{\phi} = \frac{w_t}{\phi\zeta + (1-\zeta)}. \tag{9}$$

Let us now study the nature of the dependence of the wages of the artists and the engineers described in equations (8) and (9) on the parameters ϕ and ζ. We first focus on ϕ. Recall from section 2 that ϕ can be thought of as an income distribution parameter that describes an aspect of the two groups that comprise the creative class in our region. Clearly, when $\phi = 1$, the incomes of the two groups are equal. However, $\phi \in (0, \infty)$. Therefore, to the right of the point $\phi = 1$, as $\phi \to \infty$ we have inequality of one kind because the income of artists becomes much *larger* than the income of engineers. In contrast, to the left of the point $\phi = 1$, as $\phi \to 0$ we have inequality of a second kind in that the income of artists becomes much *smaller* than the income of engineers.

Moving on to ζ, recall that this parameter denotes the fraction of artists in the total creative class population in our region. We now consider three cases. In the first case we have $\phi > 1$. Differentiation of equations (8) and (9) with respect to ζ reveals that $\partial w_t^A / \partial \zeta < 0$ and that $\partial w_t^E / \partial \zeta < 0$. This means that when artists make *more* money than engineers to begin with, an increase in the fraction of the creative class that is made up of artists *lowers* the incomes of both artists and engineers. Second, suppose $\phi < 1$. Differentiation of equations (8) and (9) with respect to ζ yields $\partial w_t^A / \partial \zeta > 0$ and $\partial w_t^E / \partial \zeta > 0$. This tells us that when artists make *less* money than engineers in our creative region, an increase in the proportion of the creative class made up of artists *raises* the incomes of both artists and engineers. Finally, suppose $\phi = 1$. In this case, it is straightforward to verify that $\partial w_t^A / \partial \zeta = \partial w_t^E / \partial \zeta = 0$. In other words, when artists and engineers make the *same* amount of money, an increase in the fraction of the creative class composed of artists has *no* impact on the incomes of either artists or engineers. We now proceed to show that the average wage in our creative region is increasing in the physical capital per creative class member ratio.

4. A Property of the Average Wage

We begin by recalling two points from section 2. First, factor prices in our model are set equal to the pertinent marginal productivities. Second, the production process leading to the output of the knowledge or final consumption good is characterized by constant returns to scale. Now, differentiating equation (3) with respect to k_t, we get

$$r_t = \frac{dq_t}{dk_t} = \alpha k_t^{\alpha-1}, \tag{10}$$

and from the constant returns to scale property, we infer that

$$N_t^A w_t^A + N_t^E w_t^E = Q_t - r_t K_t = (q_t - r_t k_t) N_t = (1-\alpha) k_t^{\alpha} N_t. \tag{11}$$

Using equation (2) to simplify equation (11), we obtain the expression for the average wage or w_t that we seek. That expression is

$$w_t = (1-\alpha) k_t^{\alpha}. \tag{12}$$

Let us now differentiate equation (12) with respect to the physical capital per creative class member ratio k_t. This gives us

$$\frac{dw_t}{dk_t} = \alpha(1-\alpha) k_t^{\alpha-1} > 0. \tag{13}$$

From equation (13) it is clear that the average wage of the creative class members in the region under study is *increasing* in the physical capital per creative class member ratio. Our next task is to derive an expression for the steady state physical capital per creative class member ratio.

5. The Steady State Value

Let k^{SS} denote the steady state physical capital per creative class member ratio. To derive the relevant expression for this ratio, we begin with the savings rates specified in (4) and with equation (5). We can represent the total savings of the artists and the engineers in our creative region by

$$S_t = \lambda^A w_t^A N_t^A + \lambda^E w_t^E N_t^E. \tag{14}$$

We now want to derive an equation describing the temporal evolution of the physical capital stock per creative class member. To this end, observe that

$$k_{t+1} = \frac{K_{t+1}}{N_{t+1}} = \frac{S_t}{N_{t+1}} = \frac{\lambda^A w_t^A N_t^A + \lambda^E w_t^E N_t^E}{N_{t+1}}. \tag{15}$$

To make further progress, it will be necessary to simplify the ratio on the right-hand-side (RHS) of equation (15). We do this in three steps. In the first step, we get

$$k_{t+1} = \{\lambda^A w_t^A \zeta + \lambda^E w_t^E (1-\zeta)\} \frac{N_t}{N_{t+1}}. \tag{16}$$

Using the definition of the parameter ϕ, the constant growth rate of the creative class population c, and equations (8) and (9), the second step yields

$$k_{t+1} = \left\{\frac{\lambda^A \phi\zeta}{\phi\zeta+1-\zeta} + \frac{\lambda^E (1-\zeta)}{\phi\zeta+1-\zeta}\right\} \frac{w_t}{1+c}. \tag{17}$$

In the third and final step, let $\lambda = \{\phi\zeta\lambda^A + (1-\zeta)\lambda^E\}/\{\phi\zeta + (1-\zeta)\}$. Using this last expression and equation (12), equation (17) can be simplified to

$$k_{t+1} = \left\{\frac{\lambda(1-\alpha)}{1+c}\right\} k_t^{\alpha}. \tag{18}$$

We know that in the steady state we must have $k_{t+1} = k_t = k^{SS}$. However, from equation (18), we see that $k^{SS} = \{\lambda(1-\alpha)/(1+c)\}\,(k^{SS})^{\alpha}$. Therefore, simplifying this last equation, we get

$$k^{SS} = \left\{\frac{\lambda(1-\alpha)}{1+c}\right\}^{1/(1-\alpha)}. \tag{19}$$

Equation (19) gives us the expression for the steady state physical capital per creative class member ratio that we seek. Having derived this expression, we are now in a position to study issues related to the distribution of income in our creative region. We conduct this study in the following two sections. In the next section, we demonstrate that in a particular situation, the distribution of income does not affect the steady state physical capital per creative class member ratio or k^{SS}.

6. Unchanged Steady State Physical Capital per Creative Class Member Ratio

The particular situation we have in mind is one in which the savings rates of the artists and the engineers are identical constants. In symbols, this means that $\lambda^A = \lambda^E = \hat{\lambda}$. Substituting $\hat{\lambda}$ into the equation for λ stated right after equation (17) and then simplifying the resulting expression, we see that the income distribution parameter ϕ drops out and hence k^{SS} is *independent* of ϕ. This is why the distribution of income among the two creative class groups does *not* affect the steady state physical capital per creative class member ratio.

To see why the above result holds intuitively, note the following line of reasoning. If the two groups that together comprise the creative class save the same proportion of their income then the aggregate saving in our creative region is also the same proportion of aggregate income. Now observe that it is the aggregate savings fraction that affects the physical capital per creative class member ratio in the steady state, regardless of the distribution of income captured by the ϕ parameter. Our final task in this paper is to determine the optimal income redistribution rule that maximizes the average steady state income of the creative class.

7. Optimal Income Redistribution Rule

Suppose that an appropriate authority in our creative region (RA) would like to maximize the average steady state income of the members of the creative class or w by redistributing income to change the income distribution parameter ϕ. To this end, we would now like to ascertain the optimal income redistribution rule that accomplishes the above task in terms of the income distribution parameter ϕ and the two savings rates λ^A and λ^E.

We begin by writing the average steady state income or w^{SS} as a function of the income distribution parameter ϕ. We get

$$w^{SS}(\phi) = (1-\alpha)(k^{SS})^{\alpha} = (1-\alpha)\{\tfrac{\lambda(\phi)(1-\alpha)}{1+c}\}^{\alpha/(1-\alpha)}. \tag{20}$$

The RHS of equation (20) can be simplified. This gives us

$$w^{SS}(\phi) = (1-\alpha)^{1/(1-\alpha)}(1+c)^{-\alpha/(1-\alpha)}\{\lambda(\phi)\}^{\alpha/(1-\alpha)}. \tag{21}$$

Let us differentiate equation (21) with respect to ϕ. We get

$$\frac{dw^{SS}(\phi)}{d\phi} = (1-\alpha)^{1/(1-\alpha)}(1+c)^{-\alpha/(1-\alpha)} \left\{\frac{\alpha}{1-\alpha}\right\} \{\lambda(\phi)\}^{[\{\alpha/(1-\alpha)\}-1]} \left\{\frac{d\lambda}{d\phi}\right\}. \tag{22}$$

Using the equation for λ given right after equation (17), the derivative $d\lambda/d\phi$ on the RHS of equation (22) can be simplified. After some algebra, the sign of the resulting derivative is

$$\frac{d\lambda}{d\phi} = \frac{\zeta(1-\zeta)}{(\phi\zeta+1-\zeta)^2}(\lambda^A - \lambda^E) < 0. \tag{23}$$

Equations (22) and (23) together tell us that the average income of the members of the creative class is *decreasing* in the income distribution parameter ϕ. Therefore, the RA will want to set the value of ϕ *close to zero*. Intuitively, to see why this result arises, note that from equation (20), we know that the average steady state income of the members of the creative class or w^{SS} is increasing in the steady state physical capital per creative class member ratio or k^{SS}. Therefore, the RA will want to increase aggregate savings in our creative region. To do this, the RA will want to redistribute income towards the group in the creative class that saves a *higher* fraction of its income. In the present context, the inequality in (4) tells us that relative to the artists, the engineers save a greater fraction of their income. Consequently, in order to maximize the steady state average income of the members of the creative class, the RA will want to redistribute income away from the artists and towards the engineers.

Note that the direction of the inequality in (4) is without loss of generality because if this direction had been reversed, i.e., if we had $0 < \lambda^E < \lambda^A < 1$ then the general finding of this section that the RA ought to redistribute income towards the group in the creative class that saves a *higher* fraction of its income would still be valid except that in this last instance, the RA would be redistributing income towards the artists and not the engineers in the creative class. This completes our discussion of artists, engineers, and aspects of economic growth in a creative region.

8. Conclusions

In this paper we analyzed aspects of economic growth in a region that was creative in the sense of Richard Florida. Members of the creative class fell into one of two possible groups. This grouping stemmed from the manner in which creative capital was acquired by the individual members. In this setting, we completed five tasks. First, we derived the wage of members in each of the two creative class groups. Second, we showed that the average wage increased with the physical capital per creative class member ratio. Third, we derived an expression for the steady state physical capital per creative class member ratio. Fourth, we demonstrated that when the two groups comprising the creative class saved identical fractions of their income, the distribution of income did not affect the steady state physical capital per creative class member ratio. Finally, we ascertained the optimal income redistribution rule that maximized the average steady state income of the creative class in the region under study.

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 extend the analysis conducted here by considering the case in which the savings rates of the two groups comprising the creative class are not constant but time varying. Second, it would also be instructive to embed the economy of the creative region analyzed here in a probabilistic environment and then analyze the impact that uncertainty either in the temporal evolution of the stock of physical capital or in the production of the final consumption good has on the functioning of the economy under study.

Studies that analyze these aspects of the underlying problem will provide additional insights into the connections between the activities of artists and engineers in a creative region and economic growth in this same region.

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