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Creative Class Competition and Innovation in the Absence of Patent Protection

by

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Abstract

Recently, Batabyal and Yoo (2018) have analyzed Schumpeterian competition in a region that is creative *a la* Richard Florida and where the creative class is made up of existing and candidate entrepreneurs. These researchers assume that an existing entrepreneur has a fully enforced patent on the inputs or machines that he has produced. We dispense with this assumption and study a scenario in which there is *no* patent protection for the representative existing entrepreneur (REE). This REE can undertake two possible types of innovation at the same cost. The first (second) type of innovation is general (specific) and hence can (cannot) be copied by the so called candidate entrepreneurs. In this setting, we perform two tasks. First, we show that although the REE will *never* undertake the general innovation, he may undertake the specific innovation. Second, we point out that even though the general innovation is not undertaken, the value to the creative region from the general innovation *exceeds* that from the specific innovation.

Keywords: Creative Class, General Innovation, Patent, Specific Innovation

1. Introduction

There is no gainsaying the fact that both regional scientists and urban economists are now very familiar with the twin concepts of the *creative class* and *creative capital*. In this regard, the originator of both these concepts, Richard Florida (2002, p. 68), has helpfully explained that the creative class "consists of people who add economic value through their creativity." In addition, this class is composed of a variety of professionals such as doctors, lawyers, scientists, engineers, university professors, and, notably, bohemians such as artists, musicians, and sculptors. We ought to think seriously about the activities of these people because 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 (2014), the group of people constituting the creative class gives rise to ideas, information, and technology, outputs that are important for the growth and development of cities and regions.[1] From a practical perspective, what this means is that in our present-day era of globalization, regions that want to be successful need to do all they can to attract and retain members of the creative class because this class is the principal driver of regional economic growth. The above ideas of Richard Florida have now been theoretically and empirically studied by several researchers. Therefore, we now review this literature and then describe the specific contribution of the present paper.

2. Literature Review

Eversole (2005) maintains that present theories of regional development, inspired in part by Florida's thinking about the creative class, have resulted in the harvesting of the grassroots

[1] See Florida (2008) and Florida *et al.* (2008) for additional details on this point.

creativity of local communities in order to pursue certain development goals. Focusing on the Montreal region, Stolarick and Florida (2006) contend that certain kinds of interactions among the business, creative, design, and technical communities can have a positive impact on the innovative and total business activity in this region.

Qian (2010) concentrates on China and shows that the human capital notion outweighs the creative class concept in terms of its effects on entrepreneurship, innovation, and regional economic performance. What roles have entrepreneurship and innovation played in the regional development of Japan? Westlund and Calidoni (2010) focus on the contemporary perspectives of Richard Florida and Robert Putnam to study this question. On the basis of their study, they first note that it is not possible to give unambiguous support to either of these two perspectives. They then provide reasons to explain the prevalence of this state of affairs.

Are Richard Florida's ideas about what needs to be done to ensure the economic prosperity of cities and regions relevant in the context of large and small "city regions" in the Nordic nations? Andersen *et al.* (2010) analyze this question and show that the answer depends on the "city region" under consideration. Specifically, we learn that for large Nordic city regions, Florida's ideas are pertinent but the same cannot be said for smaller Nordic city regions. Oliveira and Breda-Vazquez (2012) concentrate on what they call the "Oporto city-region" in part because a significant component of the population of this city-region is not a member of the creative class. As such, it is unlikely that this component will benefit from urban development plans based on creativity and innovation. This notwithstanding, we learn that appropriately designed urban policy can be used to disseminate social innovation to Oporto city-region residents who are not members of the creative class.

Batabyal and Nijkamp (2013) use a theoretical model and show how the preferences of the creative class influence the attributes of the so called constant growth path (CGP) equilibrium in an urban economy. Gabe *et al.* (2013) use individual-level data from the United States Current Population Surveys and show that in the 2006-2011 time period, relative to other workers, members of the creative class had a lower likelihood of being unemployed and that the benefit of being employed in a creative occupation rose over time.

Like Andersen *et al.* (2010), Tohmo (2015) focuses on Nordic regions and points out that there is a clear positive association between the existing creative class in these regions and the birth rate of high-technology firms. In a paper that has both theoretical and empirical emphases, Buettner and Janeba (2016) contend that in some scenarios, German cities face strong incentives to attract members of the creative class by providing these members with the apposite amenities. Finally, Goldberg-Miller and Fregetto (2016) contend that if the meaning of what it means for a sector in an urban setting to be creative is broadened then this broader meaning of a creative sector can be effectively employed to revive decaying and decrepit areas and neighborhoods in today's cities.

Recently, Batabyal and Yoo (2018) have analyzed Schumpeterian competition[2] in a region that is creative in the sense of Richard Florida and where the creative class is made up of existing and candidate entrepreneurs. These researchers assume that an existing entrepreneur has a *fully enforced patent* on the inputs or machines that he has produced. This assumption notwithstanding, one can certainly ask: What are the properties of innovative activity that arises from the competition between existing and candidate entrepreneurs when there is *no* patent

[2] See Batabyal and Nijkamp (2014) and Batabyal and Beladi (2016) for additional perspectives on Schumpeterian competition and regional economic growth.

protection for the representative existing entrepreneur (REE)? The basic contribution of our paper is to shed light on this hitherto unstudied and yet salient research question.

The model we work with is adapted from Acemoglu (2009, pp. 416-422) and Batabyal and Yoo (2018). This model is described in detail in section 3 and as noted there, the REE can undertake two possible types of innovation at the same cost. The first (second) type of innovation is general (specific) and therefore can (cannot) be copied by the candidate entrepreneurs. In this setting, we perform two tasks. First, in section 4, we show that although the REE will *never* undertake the general innovation, he may undertake the specific innovation. Next, in section 5, we point out that even though the general innovation is not undertaken, the value to the creative region from the general innovation *exceeds* that from the specific innovation. Finally, in section 6, we conclude and then offer two suggestions for extending the research delineated in this paper.

3. The Theoretical Framework

Consider a stylized region that is creative in the sense of Richard Florida. There is no uncertainty. Following Batabyal and Yoo (2018), the creative class in this region consists of existing entrepreneurs. There are a large number of $N > 0$ existing entrepreneurs. As a result of having undertaken research and development (R&D), these existing entrepreneurs have access to a technology that can be used to produce one unit of the final consumption good that we suppose is a knowledge good such as a smartphone. The output of this knowledge good is denoted by O. The marginal cost of producing one unit of output O is $\zeta > 0$. The demand for output O is given by the function $D(\cdot)$ where

$$O = D(P), \tag{1}$$

$P > 0$ is the price of the knowledge good, $D'(P) < 0, D(\zeta) > 0$, and the price elasticity of demand $\epsilon_D(P) = -PD'(P)/D(P)$ lies in the open interval $(1, \infty)$. In words, the assumption $D(\zeta) > 0$ means that there is positive demand for the knowledge good when its price is equal to the marginal cost of production. In addition, the assumption about the magnitude of the price elasticity of demand means that a profit maximizing (monopoly) price for the knowledge good exists and that the monopoly price of the knowledge good exceeds the marginal cost of producing it.

Now, of the N different existing entrepreneurs, suppose that one particular entrepreneur, that is, the REE, has access to a technology that gives rise to two possible process innovations. The cost of undertaking either of these two innovations is identical and denoted by $C > 0$. We suppose that there is *no* patent protection available to the REE. From a practical perspective, this means that these process innovations are both non-rival and non-excludable.[3]

Of the two possible innovations generated by the REE, the first innovation results in a *general* technological improvement and therefore this innovation can be copied by all the remaining $N - 1$ entrepreneurs. To clearly distinguish between the REE and the remaining entrepreneurs, we shall refer to these $N - 1$ entrepreneurs as *candidate entrepreneurs*. The reader should note that these candidate entrepreneurs are able to copy a general innovation undertaken by the REE. The general innovation reduces the marginal cost of producing one unit of the knowledge good from ζ to ζ/β where $\beta > 1$. The second innovation is *specific* to the production process employed by the REE and therefore this innovation cannot be copied by the candidate entrepreneurs. This specific innovation reduces the marginal cost of producing one unit of the final good by $\hat{\beta} < \beta$.

[3] The impact of two types of process innovations on regional economic growth in the presence of patent protection is discussed in Batabyal and Yoo (2018).

Now, with this theoretical framework in place, our next task is to demonstrate that although the REE will never undertake the general innovation, he may undertake the specific innovation. While undertaking this exercise, we shall adapt some of the results in Peters and Simsek (2009, pp. 192-193) to our analysis of creative class competition and innovation in the absence of patent protection.

4. The Innovation Decision

4.1. Intuitive discussion

To see why the REE will never undertake the general innovation, note the following line of reasoning. Undertaking the general innovation will result in *ex post* competition with the candidate entrepreneurs and this competition will reduce the price of the knowledge good from the pre-innovation marginal production cost ζ to the post-innovation marginal production cost ζ/β. In other words, both before and after undertaking the general innovation, the revenue to the REE is zero and the benefit from this innovation is $-C$.

4.2. Theoretical analysis

Following Acemoglu (2009, pp. 418-419), let us call an innovation a drastic innovation if undertaking this innovation will result in the REE becoming a monopolist. Now recall from the discussion in section 3 that the specific innovation reduces the marginal cost of producing one unit of the final good by $\hat{\beta} < \beta$. This means that the specific innovation is *less* drastic than the general innovation.[4] Given this state of affairs, the key question now is this: Will the REE undertake a specific innovation? Let us investigate.

It is clear that if the REE does not undertake the specific innovation then his profit is zero. On the other hand, if the REE does undertake the specific innovation then in the post-

[4] See Acemoglu (2009, pp. 418-420) for a textbook discussion of the differences between drastic and non-drastic innovations.

innovation scenario, he will have monopoly power. So, to understand the innovation decision in this case, we need to distinguish between two cases. These are the "drastic" and the "non-drastic" cases delineated in Proposition 12.1 in Acemoglu (2009, p. 419).

Let P^M denote the monopoly price of the knowledge good whose output is denoted by O. Then, from the above mentioned Proposition 12.1, we can deduce that the threshold β^T that determines the boundary between a drastic and a non-drastic innovation is given by

$$\beta^T = \frac{1}{1-\{1/\epsilon_D(P^M)\}}. \tag{2}$$

Now, if $\hat{\beta} \geq \beta^T$ then the specific innovation is, for all intents and purposes, a drastic innovation and the REE will end up charging the monopoly price for the knowledge good under consideration. In this case, his profit can be expressed as

$$\widehat{\Pi_{REE}} = P^M D(P^M) - \frac{\zeta}{\hat{\beta}} D(P^M) - C. \tag{3}$$

On the other hand, if $\hat{\beta} < \beta^T$ then the specific innovation undertaken by the REE is non-drastic and Proposition 12.1 in Acemoglu (2009, p. 419) tells us that this REE will resort to what is known as limit pricing. In turn, this pricing strategy will lead to a different expression denoting profit for the REE. The expression of interest is given by

$$\Pi_{REE} = \zeta D(\zeta) - \frac{\zeta}{\hat{\beta}} D(\zeta) - C. \tag{4}$$

Given equations (3) and (4), we can now explicitly state our REE's two-part decision rule for ascertaining whether he ought to or not to undertake a specific innovation. The first part of this rule tells us that

$$\hat{\beta} \geq \beta^T \Rightarrow innovate \Leftrightarrow \left\{P^M - \frac{\zeta}{\hat{\beta}}\right\} D(P^M) \geq C. \tag{5}$$

Similarly, the second part of this two-part rule tells us that

$$\hat{\beta} < \beta^T \Rightarrow innovate \Leftrightarrow \left\{\zeta - \frac{\zeta}{\hat{\beta}}\right\} D(\zeta) \geq C, \tag{6}$$

and the reader should note that $\{\zeta - \zeta/\hat{\beta}\}D(\zeta)$ in equation (6) can also be expressed as $\left(1/\hat{\beta}\right)\left(\hat{\beta} - 1\right)\zeta D(\zeta)$.

The section 3 discussion about the structure of our model tells us that the expressions $\{P^M - \zeta/\hat{\beta}\}D(P^M)$ and $\{\zeta - \zeta/\hat{\beta}\}D(\zeta)$ in equations (5) and (6) respectively are positive. This point leads to the conclusion that there must exist some *value* of the innovation cost, say $C^V\left(\hat{\beta}\right)$, which is a function of the innovation parameter $\hat{\beta}$, such that the REE will want to undertake a specific innovation whenever the actual innovation cost $C \leq C^V\left(\hat{\beta}\right)$. In other words, we have just demonstrated that the REE may undertake a specific innovation that cannot be copied by the candidate entrepreneurs with whom the REE is in competition. This notwithstanding, the reader should note that this specific innovation is *inferior* in the sense that it is a less drastic innovation than the general innovation that we analyzed in the first paragraph of this section. Our next and final task in this paper is to show that even though the general innovation is not undertaken, the

value to the creative region under study from the general innovation *exceeds* that from the specific innovation.

5. The Value of Innovation to the Creative Region

5.1. Intuitive discussion

We begin with a definition. Let the *value* of innovation to our creative region be given by the increase in consumer and producer surplus from an innovation less the cost of undertaking this innovation. In addition, we suppose that a benevolent "regional planner" makes pricing decisions in our creative region, keeping in mind the welfare of everybody in the region. This means that the regional planner will maximize our creative region's welfare by setting the price of the knowledge good (the marginal value) equal to the marginal cost of producing it.

5.2. Theoretical analysis

Let us denote the value to our creative region from the general innovation (β innovation) and the specific innovation ($\hat{\beta}$ innovation) by $V^G(\beta)$ and $V^S(\hat{\beta})$ respectively. Now, given the definition in the preceding paragraph, the value to our creative region from the general innovation can be expressed as

$$V^G(\beta) = \int_{\zeta/\beta}^{\zeta} D(P)dP - C = \int_{\zeta/\beta}^{\zeta/\hat{\beta}} D(P)dP + \int_{\zeta/\hat{\beta}}^{\zeta} D(P)dP - C. \qquad (7)$$

Some thought tells us that the right-hand-side (RHS) of equation (7) can be simplified and written, in part, in terms of $V^S(\hat{\beta})$. Doing this, we get

$$V^G(\beta) = \int_{\zeta/\beta}^{\zeta/\hat{\beta}} D(P)dP + V^S(\hat{\beta}) > V^S(\hat{\beta}). \qquad (8)$$

Equation (8) tells us that the value to our creative region from the general innovation clearly *exceeds* the corresponding value from the specific innovation. Now recall that in the last paragraph of section 4 we had pointed out that compared to the general innovation, the specific innovation is inferior. Equation (8) shows us that this inferiority stems from the fact that the specific innovation gives rise to a *lower* level of surplus in our creative region. This completes our analysis of competition and innovative activity undertaken by the creative class in the absence of patent protection.

6. Conclusions

In this paper, we continued a line of inquiry begun by Batabyal and Yoo (2018). These researchers analyzed Schumpeterian competition in a region that was creative in the sense of Richard Florida and where the creative class was composed of existing and candidate entrepreneurs. These researchers assumed that an existing entrepreneur had a fully enforced patent on the inputs or machines that he developed. We dispensed with this assumption and studied a scenario in which there was *no* patent protection for the REE. This REE could undertake two possible types of innovation at the same cost. The first (second) type of innovation was general (specific) and therefore could (could not) be copied by the candidate entrepreneurs. The contribution of our paper is that in this setting, we performed two research tasks. First, we showed that although the REE would never undertake the general innovation, he might undertake the specific innovation. Second, we pointed out that even though the general innovation was not undertaken, the value to the creative region from the general innovation exceeded the corresponding value from the specific innovation.

The analysis in this paper can be extended in a number of different directions. Here are two suggestions for augmenting the research described here. First, it would be instructive to

model the notion of a trade secret explicitly to see whether trade secrets provide adequate incentives for undertaking innovations in a competitive scenario in which patent protection is unavailable. Second, it would also be useful to analyze a model of the sort studied in this paper in a dynamic setting in which the copying of innovations undertaken by the REE occurs with a lag and over a finite time period. The analysis of such a model may involve the use of simulations. Studies that incorporate these aspects of the problem into the analysis will increase our understanding of the nexuses between entrepreneurial competition in the creative class and the emergence of process and product innovations.

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