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A gold rush theory of economic development

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Abstract

I present a stylized theory of regional development in which regional 'first nature' characteristics do not map uniquely into regional outcomes. The 'second nature' force is social learning about fixed but unknown regional characteristics which can bring about self-reinforcing regional development. The key difference from other agglomeration economies is that the extent of local economic activity only influences beliefs about productivity but not actual productivity so that there are no localized external increasing returns.

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1. Introduction

Ever since Alfred Marshall proposed his famous trinity of agglomeration economies—localized knowledge spillovers, localized thick markets for specialized skills and localized backward and forward linkages—they have been thought of as being inseparably related to some form of localized external increasing returns.[1] Surely, if a firm chooses to do business in a given region only because other firms already do business in that region, it must be that its productivity is increasing in the extent of local economic activity. Or must it?

In this article, I present a stylized theory of regional development that challenges this conventional wisdom. At the heart of this theory is a process of social learning about fixed but unknown regional characteristics that shapes the pattern of regional development. In particular, regions in which firms are sufficiently pessimistic about the merits of the local business environment do not develop. In contrast, regions in which some firms successfully explore the local business environment can experience fast growth as other firms rush to imitate their success.

The result is that regional 'first nature' characteristics do not map uniquely into regional outcomes to the extent that firms experiment only in some regions. The 'second nature' force is social learning that can bring about permanent disparities in regional development even if there are no permanent differences in regional fundamentals. The key difference from other agglomeration economies is that the extent of local economic

1 Indeed, the terms 'agglomeration economies' and 'external economies of scale' are often treated as synonymous in the literature. See, for example, Rosenthal and Strange (2004: 1).

activity only influences beliefs about productivity but not actual productivity so that there are no localized external increasing returns.[2]

The observation that there can be agglomeration economies even in the absence of localized external increasing returns has at least two important conceptual implications. First, it qualifies the common interpretation of Starrett's (1978) celebrated spatial impossibility theorem that 'backyard capitalism' is the necessary consequence of perfect competition and constant returns. Second, it highlights that agglomeration economies may be present even if econometricians fail to identify any relationship between firm productivity and the extent of local economic activity.[3]

Moreover, it implies that 'second nature' forces may lead to richer patterns of regional development than previously thought. In particular, if regional booms are driven by localized external increasing returns, regional development is necessarily an absorbing state since regional productivity growth is then always self-reinforcing. In contrast, if regional booms are driven by social learning, development can be temporary if the surprising success of existing firms is the result of luck and not of surprisingly good regional fundamentals.

My analysis is related to many strands of existing work. First, I was inspired by Hausman and Rodrik (2003) who argue that learning what one is good at producing is a key challenge faced by many developing countries. They emphasize that such learning necessarily has a social dimension that implies an underprovision of entrepreneurship without government intervention. In this article, I do not further investigate the normative implications of such learning but instead explore its positive effects on the economic geography of regional development.[4]

Second, I build on numerous contributions that have identified specific channels through which learning can induce agglomeration. For example, Jacobs (1969) argues that diversified urban environments encourage innovation. Also, Jovanovic and Rob (1989) say that proximity to skilled individuals facilitates the acquisition of skills.[5] Such classic learning externalities all imply localized external increasing returns which makes them distinct from the ones emphasized here.

Third, I draw from the literature on technology adoption under uncertainty. Foster and Rosenzweig (1995), Bandiera and Rasul (2006) and Conley and Udry (2010) provide evidence on the importance of learning externalities in such contexts. While their main focus is empirical, their analyses are guided by explicit models of social learning. However, these models consider social learning about how to operate a new technology. Again, this is different from the social learning considered here because it implies that firms get better with social experience.

2 While the existence of localized external increasing returns is simply assumed in much of the traditional economic geography literature, it is derived from a combination of internal increasing returns and transport costs in the new economic geography literature. See Fujita et al. (1999) for a comprehensive review.

3 Econometricians typically attempt to detect agglomeration economies by relating a firm's productivity to some measure of that firm's interaction with other firms. See, for example, Rosenthal and Strange (2004: 5-6).

4 As such, my analysis is perhaps more closely related to Caplin and Leahy (1993), Hoff (1997), and Caplin and Leahy (1998) who analyze the role of social learning about the suitability of local conditions for new business ventures in the context of structural change, the infant industry argument, and the rapid revitalization of New York's Lower Sixth Avenue, respectively.

5 A detailed discussion of all suggested mechanisms is beyond the scope of this paper. See Duranton and Puga (2004) for a comprehensive review.

Fourth, I borrow some tools from contributions on industry dynamics and social learning which take a Bayesian approach. For example, my modeling of social learning draws from Jovanovic's (1982) seminal analysis of how private learning affects the evolution of the firm size distribution over time. Also, my modeling of regional development traps can be seen as an extreme case of the strategic delays Chamley and Gale (1994) identify in the presence of informational externalities.[6]

Finally, I add to work on agglomeration and imperfect information. Specifically, Tropeano (2001) points out that high-quality firms may benefit from colocating since their voluntary exposure to competition signals their superior type to consumers. Similarly, Berliant and Yu (2010) highlight that high-skilled workers may benefit from colocating since their voluntary endurance of high house prices signals their superior type to firms. While these contributions do not emphasize social learning, they also feature a form of agglomeration that relies on imperfect information.[7]

2. Model

2.1. Setup

I consider a circular economy consisting of $R \in 2\mathbb{Z}+1$ regions. Each region has a traditional sector and a modern sector and is endowed with L units of labor and T units of land. The traditional sector uses both labor and land while the modern sector uses labor only. Initially, all labor is employed in the traditional sector in all regions so that the modern sector is not operating anywhere. Neither labor nor land can be moved across regions so that factor markets are perfectly segmented at all times.

It is uncertain how suitable regional conditions are for modern sector production and modern sector firms rely on their prior beliefs when deciding whether or not to enter into the modern sector. If their prior beliefs are optimistic enough so that there is entry into the modern sector some information is revealed. In particular, the experiences of active modern sector firms are indicative of the suitability of regional conditions for modern sector production and are used by all modern sector firms to update their prior beliefs in a Bayesian fashion.

I abstract from potential costs of entering or leaving the modern sector. Therefore, there is no intertemporal trade-off to be solved by modern sector firms when making their entry decisions. Free entry ensures that, in all time periods, the number of modern sector firms in each region is such that expected profits are driven down to zero in all regions. The equilibrating mechanism is labor market competition. Workers have to be attracted from the traditional sector which increases the wage rate.

Output prices do not play a role here. The economy is supposed to be small relative to other economies and trades both modern and traditional sector goods at fixed prices that are all normalized to 1. For simplicity, a demand side is not explicitly modeled. In a small open economy, production decisions are independent of consumption decisions, and a particular demand structure only has to be imposed if one wants to solve for domestic consumption or the pattern of international trade.

6 An overview of the broader literature on social learning is provided by Chamley (2004).

7 Such agglomeration is perhaps better referred to as stratification since it really captures the geographic sorting of types. See also Berliant and Kung (2010).

2.2. Modern sector

The output of modern sector firm i in region r at time t is given by

$$y_{irt} = \phi_{irt} l \tag{1}$$

where l is a fixed labor requirement and ϕ_{irt} is a productivity parameter that takes on a higher value $\overline{\phi}_r$ with probability p_r and a lower value $\underline{\phi}_r$ with probability $1 - p_r$.

The probability p_r captures the suitability of regional conditions for modern sector production and is given by the probability of solving a range of region-specific problems.[8] In particular, region r is assumed to be the geographic center of problem r which always occurs in region r as well as all $\tau \in \left[0, \frac{R-1}{2}\right]$ neighboring regions and is solved with probability θ_r so that

$$p_r = \prod\nolimits_{k=r-\tau}^{r+\tau} \theta_k \tag{2}$$

Denote by m_{rt} the number of modern sector firms operating in region r at time t, by z_{rt} the number of times problem r has been solved until time t, and by n_{rt} the number of times the modern sector technology has been applied in a region in which problem r can occur until time t. Notice that m_{rt} and n_{rt} are related through $n_{rt} = \sum_{k=r-\tau}^{r+\tau} \sum_{s=1}^{t-1} m_{ks}$. Since z_{rt} is simply the number of successes in n_{rt} Bernoulli trials, z_{rt} follows a binomial distribution with density

$$g_r(z_{rt} \mid n_{rt}, \theta_r) \propto \theta_r^{z_{rt}} (1 - \theta_r)^{n_{rt} - z_{rt}} \tag{3}$$

The parameters θ_r are fixed but unknown to modern sector firms. All modern sector firms observe all z_{rt} and m_{rt} and use this information to update exogenous priors about θ_r through a process of Bayesian learning. It is assumed that all modern sector firms hold the same priors characterized by a Beta distribution with density $f_r(\theta_r) \propto \theta_r^{\alpha-1}(1-\theta_r)^{\beta-1}$ so that the prior expectation of θ_r is[9]

$$E(\theta_r) = \frac{\alpha}{\alpha + \beta} \tag{4}$$

Upon noticing that Bayes' rule requires $f_r(\theta_r \mid n_{rt}, z_{rt}) \propto g_r(z_{rt} \mid n_{rt}, \theta_r) f_r(\theta_r)$, it follows immediately that posterior beliefs are also Beta distributed albeit with updated density $f_r(\theta_r \mid n_{rt}, z_{rt}) \propto \theta_r^{\alpha+z_{rt}-1}(1-\theta_r)^{\beta+n_{rt}-z_{rt}-1}$ so that $E(\theta_r \mid n_{rt}, z_{rt}) = \frac{\alpha+z_{rt}}{\alpha+\beta+n_{rt}}$. As is easy to verify, this posterior expectation of θ_r is simply a weighted average of the prior expectation (4) and the success rate $\frac{z_{rt}}{n_{rt}}$ with the weight on the prior expectation being equal to $\lambda_{rt} = \frac{\alpha+\beta}{\alpha+\beta+n_{rt}}$:

$$E(\theta_r \mid n_{rt}, z_{rt}) = \lambda_{rt} E(\theta_r) + (1 - \lambda_{rt}) \frac{z_{rt}}{n_{rt}} \tag{5}$$

Notice that λ_{rt} is decreasing in n_{rt} which is very intuitive. The success rate $\frac{z_{rt}}{n_{rt}}$ is a natural estimator of θ_r and becomes more influential relative to $E(\theta_r)$ the more experience has been gained in the modern sector. Equation (5) illustrates two important

8 These problems are meant to capture adverse regional characteristics such as adverse climate, topography, infrastructure, institutions and the like.

9 Recall that the Beta distribution is a relatively general distribution on the support [0, 1]. Basically, all reasonably smooth unimodal distributions on this support can be approximated by a Beta distribution by choosing suitable values for the parameters α and β. This includes the case of uniform priors which is probably the most intuitive starting point in the case of complete ignorance.

properties of Bayesian learning. First, only surprises change beliefs since $E(\theta_r \mid n_{rt}, z_{rt}) \lesseqgtr E(\theta_r) \iff \frac{z_{rt}}{n_{rt}} \lesseqgtr E(\theta_r) \iff \frac{z_{rt}}{n_{rt}} \lesseqgtr E(\frac{z_{rt}}{n_{rt}})$. Second, beliefs converge to the truth as the number of observations increases since $\lim_{n_{rt} \to \infty} \lambda_{rt} = 0$ and $\frac{z_{rt}}{n_{rt}}$ converges to θ_r as $n_{rt} \to \infty$.

For future reference, denote $\theta_{rt} = E(\theta_r \mid n_{rt}, z_{rt})$ and $p_{rt} = \prod_{k=r-\tau}^{r+\tau} \theta_{kt}$. Since the signals $\frac{z_{rt}}{n_{rt}}$ are generated independently across problems, p_{rt} is the best guess of the suitability of regional conditions for modern sector production in region r at time t. Notice that τ parametrizes the extent of inter-regional decay in social learning. If $\tau = 0$, each region has entirely separate fundamentals so that there is no inter-regional social learning. In contrast, if $\tau = \frac{R-1}{2}$ all regions have exactly identical fundamentals so that there is perfect inter-regional social learning. Inter-regional social learning is spatially limited in all intermediate cases.

2.3. Traditional sector

The output of the traditional sector in region r at time t is given by

$$x_{rt} = \left(T_{rt}^{T}\right)^{\gamma} \left(L_{rt}^{T}\right)^{1-\gamma} \tag{6}$$

where T_{rt}^{T} is the land employed in the traditional sector of region r at time t, L_{rt}^{T} is the labor employed in the traditional sector of region r at time t, and $0 < \gamma < 1$. Firm subscripts have been omitted since individual firm size is anyway indeterminate given technology (6).

Workers are paid a competitive wage so that the inverse labor supply curve faced by modern sector firms in region r trying to attract workers from the traditional sector in region r is given by $w_{rt} = (1-\gamma)\left(T/L - L_{rt}^{M}\right)^{\gamma}$, where w_{rt} is the wage prevailing in region r at time t and the factor market clearing conditions $L = L_{rt}^{T} + L_{rt}^{M}$ and $T = T_{rt}^{T}$ have been imposed.

Since modern sector firms have a fixed labor requirement l, it must be that $L_{rt}^{M} = lm_{rt}$ so that

$$w_{rt} = (1-\gamma)\left(\frac{T}{L - lm_{rt}}\right)^{\gamma} \tag{7}$$

Hence, the wage in region r increases in all time periods in which firms are entering into the modern sector of region r. This is, of course, due to fact that technology (6) exhibits diminishing returns to labor.

2.4. Equilibrium

All risk is assumed to be borne by modern sector firms. At the beginning of each period, modern sector firms make their entry decisions which determine regional wages. Then they discover whether they solve the region-specific problems which determine their productivities and profits. The profits of modern sector firm i in region r at time t are given by $\pi_{irt} = (\phi_{irt} - w_{rt})\, l$. Due to free entry, they will be zero in expectation and therefore positive in the good state and negative in the bad state.[10]

10 Of course, one has to assume that modern sector firms own some assets which they can use to finance the losses in the bad state. This will be done henceforth.

Recall from above that $p_{rt} = \prod_{k=r-\tau}^{r+\tau} \theta_{kt}$ denotes the best guess of the suitability of regional conditions for modern sector production in region r at time t. The expected profits of modern sector firm i in region r at time t are therefore given by

$$E(\pi_{irt} \mid n_{1t}, \ldots, n_{Rt}, z_{1t}, \ldots, z_{Rt}) = \left(p_{rt}\overline{\phi}_r + (1 - p_{rt})\underline{\phi}_r - w_{rt}\right)l \tag{8}$$

Notice that they are identical for all modern sector firms in a given region since they share the same priors and information sets by assumption.

Free entry drives expected profits down to zero in all regions.[11] Modern sector firms are not willing to invest in period t unless they expect to make profits in period t. They never invest just to learn something about the suitability of regional conditions for modern sector production since the private value of this information is zero. If there is a good surprise and regional conditions turn out to be more favorable for modern sector production, this becomes common knowledge and triggers entry in the following period.

Using the wage from equation (7), the equilibrium number of modern sector firms in region r at time t can therefore be computed by setting equation (8) equal to zero

$$m_{rt} = \kappa - \rho\left(p_{rt}\overline{\phi}_r + (1 - p_{rt})\underline{\phi}_r\right)^{-\frac{1}{\gamma}} \tag{9}$$

where the parameters $\kappa = \frac{L}{l}$ and $\rho = \frac{T}{l}(1-\gamma)^{\frac{1}{\gamma}}$ have been introduced to simplify the notation. Since $\overline{\phi}_r > \underline{\phi}_r$, the equilibrium number of modern sector firms in region r at time t is thus increasing in p_{rt}. The better regional conditions are believed to be, the more modern sector firms are operating.

Together with the definition of p_{rt} and the expression for the posterior expectation, equation (9) implies

$$m_{rt} = \kappa - \rho\left(\prod_{k=r-\tau}^{r+\tau} \frac{\alpha + z_{kt}}{\alpha + \beta + n_{kt}}\left(\overline{\phi}_r - \underline{\phi}_r\right) + \underline{\phi}_r\right)^{-\frac{1}{\gamma}} \tag{10}$$

Hence, the number of modern sector firms in region r at time t depends on the number of modern sector firms in previous periods as well as the problem solving history in region r as well as all τ neighboring regions. The industrialization path is stochastic, since changes in beliefs are driven by stochastic problem solving histories.

To make the model interesting, I assume that

$$\underline{\phi}_r < \left(\frac{\rho}{\kappa}\right)^{\gamma} < \overline{\phi}_r \tag{11}$$

This assumption ensures that the modern sector firms' entry decisions are not independent of their beliefs. If $\left(\frac{\rho}{\kappa}\right)^{\gamma} < \underline{\phi}_r$, the initial wage rate in region r would be so low that it would be profitable to enter the modern sector even if the bad state occurred with certainty. Similarly, if $\overline{\phi}_r < \left(\frac{\rho}{\kappa}\right)^{\gamma}$, the initial wage rate in region r would be so high that it

11 I assume that the integer problem can be ignored. This amounts to assuming that the number of modern sector firms is sufficiently large to ensure that profits are relatively close to zero but also sufficiently small to ensure that learning is not instantaneous. Alternatively, I could assume that firms are infinitesimally small but all get the same productivity draw in any given time period. While this would be perhaps a somewhat cleaner modeling choice, it would also make the learning process less realistic. And it would, in any case, leave all results unchanged.

would not be profitable to enter the modern sector even if the good state occurred with certainty.

With this condition, there exists an expected success probability $\overline{p}_r$ such that the modern sector is operating in region r if and only if beliefs are more optimistic than $\overline{p}_r$. From equation (9) it follows that this threshold belief is given by

$$\overline{p}_r = \frac{\left(\frac{\rho}{\kappa}\right)^{\gamma} - \underline{\phi}_r}{\overline{\phi}_r - \underline{\phi}_r} \tag{12}$$

It is easy to show that $\overline{p}_r$ is decreasing in $\overline{\phi}_r$ and $\underline{\phi}_r$ given that the parameter restriction (11) is satisfied. This is not surprising since higher productivities make modern sector production more attractive regardless of the suitability of regional conditions.

3. Analysis

In this environment, the pattern of regional development is shaped by an interaction of priors, fundamentals and chance. This can be seen most clearly in the benchmark case $\tau = 0$ in which there is no inter-regional social learning so that it is sufficient to focus on a single region r. For the sake of argument, I assume that $\theta_{r1} = \overline{p}_r$ which implies that priors are just too pessimistic to support modern sector production in the first time period since $p_{rt} = \theta_{rt}$ if $\tau = 1$. I envision that entry into the modern sector is triggered by a small temporary positive shock to $\underline{\phi}_r$ or $\overline{\phi}_r$ that could reflect a small temporary shift towards more business-friendly policies.

Equation (9) makes clear that the pattern of modern sector development is driven only by the evolution of beliefs about the suitability of regional conditions for modern sector production that depends on the stochastic experiences of modern sector firms. In particular, there is entry into the modern sector whenever beliefs become more optimistic which is the case if modern sector firms happen to solve a surprisingly large fraction of problems. Similarly, there is exit out of the modern sector whenever beliefs become less optimistic which is the case if modern sector firms happen to solve a surprisingly small fraction of problems.

Notice that these beliefs must either converge to the threshold belief $\overline{p}_r$ or to the true p_r. Either a sufficient accumulation of bad surprises drags down beliefs to the threshold belief so that the modern sector stops operating and there is no further learning. Or beliefs always remain above the threshold belief so that the modern sector continues operating in which case equation (5) implies that beliefs converge to the truth. Of course, beliefs always converge to $\overline{p}_r$ if regional conditions are not suitable for modern sector production in the sense that $p_r < \overline{p}_r$. Hence, the final outcome is only dependent on the stochastic experiences of modern sector firms if $p_r > \overline{p}_r$.

The regional development experience can therefore only take two basic forms in the benchmark case $\tau = 0$. Either the temporary productivity shock only induces temporary modern sector activity and the long-run number of modern sector firms is zero. This happens with certainty if $p_r < \overline{p}_r$ and with positive probability if $p_r > \overline{p}_r$. Or the temporary productivity shock kick-starts permanent modern sector activity and the long-run number of modern sector firms is the full-information number of firms $m_r^{FI} = \kappa - \rho\left(p_r\overline{\phi}_r + (1 - p_r)\underline{\phi}_r\right)^{-\frac{1}{\gamma}}$ implied by equation (9). This happens with positive probability only if $p_r > \overline{p}_r$.

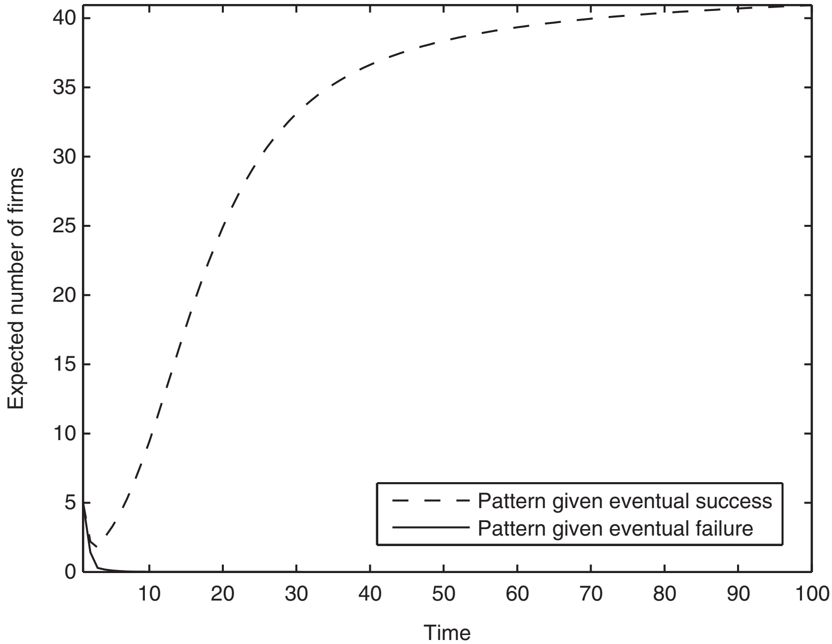

Figure 1. Patterns of regional development without inter-regional social learning. *Notes:* The simulation is based 100,000 iterations using the parameter values $\tau=0$, $L=100$, $T=100$, $l=1$, $\gamma=0.5$, $\underline{\phi}_r=0.1$, $\overline{\phi}_r=0.9$, $\alpha=\beta=100$, and $\theta_r=0.7$ but looks qualitatively similar for other values.

These development patterns are illustrated in Figure 1 using a concrete example in which $\tau=0$, $p_r > \overline{p}_r$, and an initial temporary productivity shock ensures that $m_{r1}>0$. The dashed line plots the expected pattern of regional development conditional on the region developing eventually. The solid line contrasts this with the expected pattern of regional development conditional on the region not developing eventually. The lines are constructed by averaging over the relevant subsets of a large set of simulated development paths. As can be seen, successful regions can be expected to experience sudden and rapid modern sector growth while unsuccessful regions can be expected to have only short spells of modern sector activity.[12]

The possible self-reinforcing character of regional development implies that regional 'first nature' characteristics do not map uniquely into regional outcomes. The 'second nature' force is social learning about the suitability of regional conditions for modern sector production which can bring about permanent disparities in regional economic activity even if there are no permanent differences in regional fundamentals.[13] The key difference from other agglomeration economies is that the extent of regional economic

12 The sharp drop in modern sector activity following the first time period is an artifact of the reversal of the temporary productivity shock.

13 To be clear, permanent differences in regional development can arise even if there are no permanent differences in fundamentals if either some regions experience positive temporary productivity shocks and others do not, or if all regions experience positive temporary productivity shocks but modern sector production thrives in some regions but is given up in other regions as a result of chance.

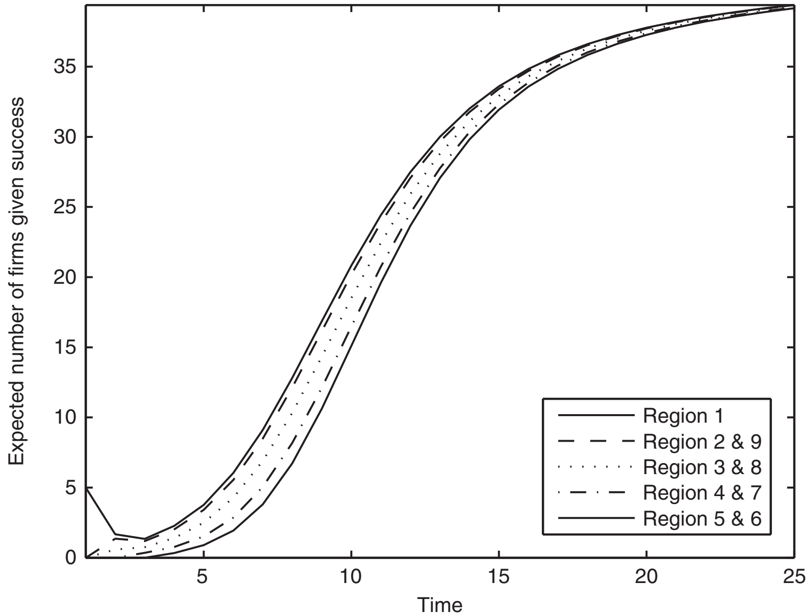

Figure 2. Contagious regional development with inter-regional social learning. *Notes:* The simulation is based 100,000 iterations using the parameter values $\tau = 1$, $L = 100$, $T = 100$, $l = 1$, $\gamma = 0.5$, $\underline{\phi}_r = 0.1$, $\overline{\phi}_r = 0.9$, $\alpha = \beta = 100$, and $\theta_r = 0.7$ but looks qualitatively similar for other values. I normalize $p_r = \left(\prod_{k=r-\tau}^{r+\tau} \theta_k\right)^{\frac{1}{2\tau+1}}$ to ensure comparability with Figure 1.

activity only influences beliefs about regional productivity and not actual regional productivity so that there are no localized external increasing returns.

In particular, the fundamental productivity parameters p_r, $\underline{\phi}_r$ and $\overline{\phi}_r$ always remain unchanged and an econometrician should always be expected to find modern sector labor productivity to be equal to $p_r\overline{\phi}_r + (1 - p_r)\underline{\phi}_r$. This has at least two important conceptual implications. First, it qualifies the common interpretation of Starrett's (1978) celebrated spatial impossibility theorem that 'backyard capitalism' is the necessary consequence of perfect competition and constant returns. Second, it highlights that agglomeration economies may be present even if econometricians fail to identify any relationship between firm productivity and the extent of local economic activity.

Naturally, the likelihood of observing permanent differences in regional outcomes even if there are no permanent differences in regional fundamentals is smaller in the presence of inter-regional social learning. In this case, the potential for contagious regional development is the most salient additional feature of the model. This feature is illustrated in Figure 2 using a symmetric nine region example in which $\tau = 1$, $p_r > \overline{p}_r$ for all r, and an initial temporary productivity shock in region 1 ensures that $m_{r1} > 0$. The lines plot the expected patterns of regional development conditional on region 1 developing eventually and are again obtained through simulation.

As can be seen, successful modern sector development in region 1 can then be expected to spur economy-wide modern sector development through a process of cumulative contagion. In particular, the surprising success of firms in region 1 can then be expected to encourage firms from the immediately neighboring regions 2 and 9 to enter, whose surprising success can in turn be expected to encourage firms from the immediately neighboring regions 3 and 8 to enter, and so on. Of course, it is still possible to get permanent differences in regional outcomes even if there are no permanent differences in regional fundamentals if regional priors are pessimistic enough to prevent a neighbor's success from causing entry.

4. Conclusion

I presented a stylized theory of regional development in which regional 'first nature' characteristics did not map uniquely into regional outcomes. The 'second nature' force was social learning about fixed but unknown regional characteristics which could bring about self-reinforcing regional development. The key difference from other agglomeration economies was that the extent of local economic activity only influenced beliefs about productivity but not actual productivity so that there were no localized external increasing returns.

Of course, this difference is likely to make the effects of this agglomeration economy less persistent than the effects of other agglomeration economies since overly pessimistic initial beliefs are likely to be corrected eventually in practice. The key assumptions permitting permanent differences in regional development in the model were that experience immediately becomes common knowledge and free entry immediately eliminates all profits. Otherwise, there could have been private value to gaining experience which would have attenuated the results.

To be clear, I did not intend to suggest that social learning about fixed but unknown regional characteristics is a more important determinant of the geography of regional development than any other previously suggested agglomeration economy. Instead, I only sought to provide a plausible counterexample to the conventional wisdom that agglomeration economies are inseparably related to some form of localized external increasing returns and point out some conceptual implications this has for the theory and empirics of regional economics.

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