



Theory of Human Settlements & Empire Collapse

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Abstract

In this paper, we consider how humans are drawn together into larger and larger settlements until we go from Tribes of 150 people to cities such as NYC. The familiar economic multiplier is the key to understanding how communities grow. From this, we can see what forces draw people together until eventually they are drawn apart leading to the collapse of an empire.

Keywords: Human needs; Economic multiplier; Cusack hinterland factor; Settlements; Empires

Introduction

We consider what is the law of city building. What causes humans to come together to form tribes, communities, and eventually cities? The answer lies in human needs. We shall mention IX here, although the reader may think of more. No more than IX are necessary to explain how cities come to be formed such as London, New York, or Paris.

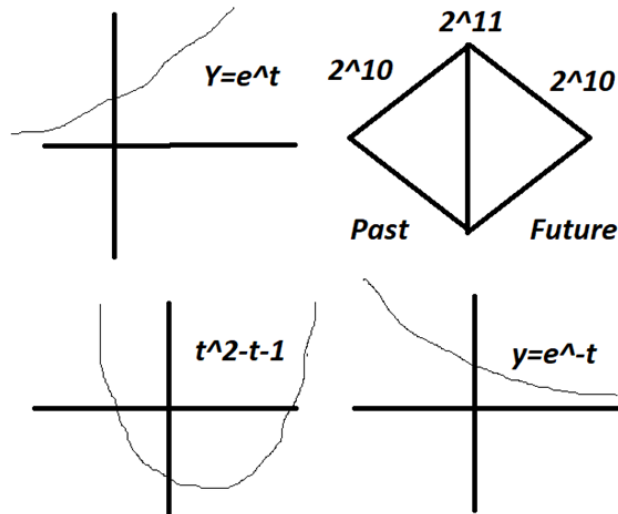
I shall list the IX human needs:

1. Food (hunters; gathers; famers; divided labour)
2. Work (Money; economy)
3. Shelter (homes, work places; religious centres; schools etc.)
4. Sex for the begetting of children (marriage)
5. Child Rearing for continued survival of the species
6. Intellectual stimulus which begets language and is enhanced by storytelling and education.
7. Religion Life of the Soul (after life; hope)
8. Funeral Rites (Burial)
9. Medicine (health, death)

We have enough needs to put an equation to each of these major divisions. Then we can solve the equations to see what we get (Figure 1).

- (1)(2) Economic Equation $Y=C+I+G+NX$
- (3) Shelter =Space $PV/FV=Cusack\ Hinterland\ Factor=2\pi$
 $=E=Y \quad s=|E|t \sin 60^\circ$

- (4,5) Children /Population growth $Y=e^t$
- (6) Looking Back (history); Looking forward (Education) $Y=2^{20}$
- (7)(8) Soul S.E.= $t^2-t-1=0$
- (9) Death $Y=e^{-t}$



$$Y=2^{20}=t^2-t-1=1.0485$$

$$t \sim 1.618$$

$$Y=C+I+G$$

$$Y=C+(1-0.8415) + (14.28\%)$$

$$Y=5.02-0.3018$$

$$C=4.7182$$



$=2+e^1$
 $=2 + \text{population growth} = 2+\text{children}=\text{Father and mother}$
 $+\text{children}=\text{Replacement rate} +\text{children}$
 $Y=e^{-t}=e^{-1.618}$
 $=19829^{-2}$ (replacement rate)
 $\text{Pop}-Y=e$
 $\text{Ln}(\text{pop.}-Y)=\text{Ln}(4.7182-0.504)=14.38\%=1/0.695$
 $\sim 1/7$
 $=\text{Economic Multiplier}$
 The economic multiplier is the rate at which tribes, communities,
 and cities must increase to survive.
 So, space $s=|E||t| \sin 60^\circ$
 $1.334=(2\pi)(t)0.866$
 $t=0.246 \sim 0.250=\text{Period T}$
 $1/t=E$
 $1/0.250=40=FV$
 $0.400 \times 1/7=5714^{-1} \text{ rad}=E=t$
 $2\pi/4(.718-2)=\text{Ln } \pi=t_{\max}$
 $\text{Ln } \pi=23.1=\text{Ln}(\text{pop}-Y)$
 $\text{Pop}-Y=\pi=23.1$
 $23.1-\text{PI}=1995^{-2}$
 $\text{Ln } 2=3=c$

We've seen why humans come together; Now let us turn our attention to Empires and why they come apart (Table 1) [1-2].

Empire	Age	Ln	Ln (Ln)
Egypt	4000	8294	6.72
Romans	2000	7600	6.63
Kings of France	900	680	6.522
USA	231=(1789-2020AD)	544	6.299
Average	1012~1000		6.54

$e^{-6.54}=6922^{-7}$
 $1/7$ is the economic multiplier, again
 $F_{\text{attraction}} \propto \text{Market Value}$
 $F_{\text{repulsion}} \propto 1/FV = 1/2x^2$
 $MV=1/FV$
 $MV=1/2.68$
 $FV=1592=1/2\pi$
 $MV=1/FV=2\pi=$ Cusack Hinterland Factor
 $F_{\text{att}}=F_{\text{rep}}$
 $2.68=1/(2x^2)$
 $2(2.68)x^2=1$
 $x=432$
 $=1/2.315$
 $=1/t$
 $=E$

$t=231(1789-2020 \text{ AD})$

Conclusion

We see that there is indeed a system of equations that explain growth of communities.

References

1. Beinart J. Lectures theory of city form. Open Courseware, MIT. 2013.
2. Cusack PTE. Teleological Universe (submitted).