The Origins of Mass Warfare: A System Dynamics Approach

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Abstract

People of different nations often meet with the intent of destroying each other with the technology and techniques of modern warfare. This has come to be the reality of modern politics. Yet mass warfare has not been a permanent fixture throughout the history of mankind. In this paper, an attempt is made to gain a better understanding of what caused the transition from localized tribal feuding

Introduction

There are two hypotheses which attempt to explain this change. The first is that as communities became more sedentary people became less willing to move, or harder to scare away, and thus fought to the death. The second is that the rise of a standing military in the social structure led to this change to destruction. Both of theses hypotheses are dependant upon the rise of an agricultural economy.

This paper will look at each hypothesis individually. The first will be presented by the technique of causal-loops while the second will be modeled using the STELLA program.

Background

Early in human history, about 10,000 B. C., humanity lived in bands. These bands varied in size from 5 to 30 members and survived by the techniques of hunting and gathering. Because of the hunting and gathering economy the bands were quite nomadic, moving to where the hunting and gathering was best.

Sometimes in their roaming, one band would meet another. Even though the bands moved about quite a bit they were very territorial, with a certain band's territory being the area where they were at the time. When neither band was willing to move, a conflict arose.

These bands would settle conflicts in a very ritualized manner, referred to as feuding. The objective was not kill the opponents but to scare them away. Representatives from each community would meet and set a time and place at which the bands would meet. At the appointed time the men of each band, armed with shields, javelins, and bows, would form two lines facing one another approximately 100 meters apart. The two lines would then go through a series of yelling and shield banging in an attempt to frighten the other line. If both lines were still remained through this period (i.e. neither had fled in terror) then missile fire was exchanged. At 100 meters the aim of the 'combatants' was none to good, so injuries were relatively few. When a side extinguished its supply of weapons, the line broke and ran leaving the remaining band the victors. Clearly the idea was to scare the other tribe away, not to hurt or kill them.

Somewhere in the course of history feuding gave way to the concepts of warfare, in which destruction of the enemy is the primary objective.

Hypothesis 1

The first hypothesis is most easily stated, and discussed, by a causal loop diagram. Figure 1 is such a loop and the rest of this section will be describing the logic behind each loop as well as its significance towards the overall question of the cause of warfare.

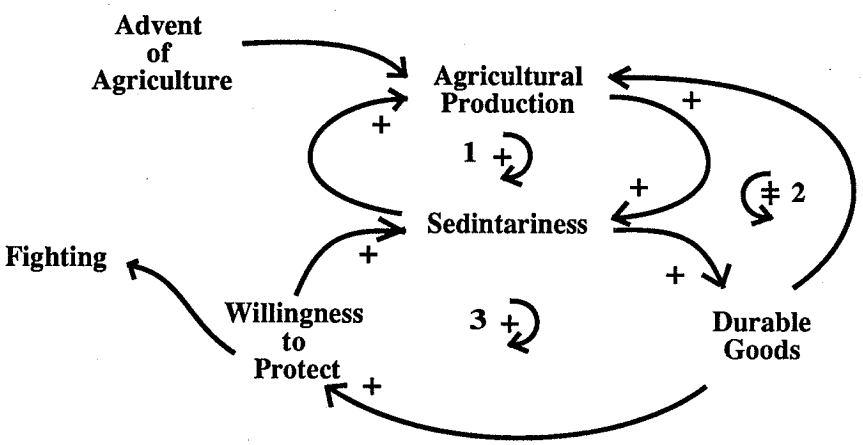

Figure 1

To begin, there is the advent of agriculture sometime in the range of 7,000 B. C. This caused the beginnings of agricultural production, or better yet an increase from the previous state of zero.

An increase in the agricultural production of the band would have increased the sedentariness of the community. Agriculture gives a reliable, stationary

source of food. Since the band no longer has to wander in search of food it is much more likely to stay in the same place, to become more sedentary. Therefore a positive link between the two factors.

The increase in sedentariness in turn lead to an increase in agricultural production. This is due to the fact that it is much easier each year to cultivate crops then the previous year. Anyone who has worked in a background garden is familiar with this phenomenon. The more work put into the plot, year after year, the better the plot will perform.

Thus, as the community continues to cultivate the same plot of land both its agricultural productivity increases as well as its sedentariness. Thus the first positive feedback loop is formed.

The second loop is another reaction to an increase in sedentariness. As the community remains in one place there will start to be an accumulation of durable goods. These are things which would have been left behind when the band was more nomadic. To begin with these would be rudimentary tools, things which could have been easily remade when a new location was reached. Since time was no longer being used to remake those tools, better things could be made, tools which could help in the agricultural production.

Tools were not the only good to increase with greater sedentariness. There would be an accumulation in the amount of seeds. In (hypothetically) year one of agriculture, there would be at most a handful of seeds to plant. This amount will clearly increase exponentially over time if the band stays at the same location.

So a positive loop to production is made. This is similar to the loop containing sedentariness and agricultural production, but it is subtly different. This increase in agricultural production is due to those better tools while the first link is due solely to re-cultivation of the same plot of land.

A few hundred years pass. We now have a semi-sedentary community which supports itself primarily by agricultural production, let's call it Band Sed. Due to its sedentariness, it has accumulated a certain amount of durable goods, possibly even some domesticated animals. Overall life is good and prosperous for the Seds. Now suppose a more nomadic band, the Noms, move into the area, sees the prosperity of the first band and decides to stay. Very little has changed culturally for our bands, they are still very territorial. A conflict has arisen which needs to be settled.

As expected, the two bands go through the ritualized feuding process. But this time things are not as they were in the past. Band Sed has something more at stake then Band Nom has. Band Sed has their fields, tools, supplies, and animals which they would have to give up if they were not victorious. In effect they would give up their lifestyle. So when the Seds sees that they are loosing the 'battle', instead of fleeing, they charge the Nom band. When they reach the other line, they beat and kick the Noms, trying to drive them in the same manner as they drive off wild animals. The Noms will use similar tactics to protect themselves. We now

have two bands attacking each other using methods which had previously been reserved for animals, the idea of 'putting the other out of commission', or fighting.

This is what loop 3 is describing. As described before, an increase in durable goods occurs as the community becomes more sedentary. This increase in durable goods can almost be thought of as symbolic of the ease of life in the community, for with more tools, other goods can be produced with less effort. Concurrent with the rise in durable goods, one finds the rise of a willingness of the members of the community to protect or to keep what they have. This desire can be strong enough to overpower the conventions which have been established by tradition. When this is the case, fighting occurs as described in the case of the Seds and Noms. To complete the loop, if the band is victorious, then they are now more sedentary then previously since they have invested themselves totally in the defense of the community.

Hypothesis 2

Hypothesis one describes a transition from band feuding to fighting. however, this fighting is not near what could be considered warfare. The most obvious difference between this fighting and warfare is the lack of intent to kill. Band fighting was mainly an accident. It was still an attempt to drive the other band from the area, not to annihilate it which is a characteristic of war. But strange things were happening at the social and economic levels of the community which would soon change that.

As seen in the first hypothesis, the catalyst of the transition was agricultural production. The transition could not have happened in a hunting-gathering economy because they are inherently nomadic. It was the increase in sedentariness and thus durable goods which caused the fighting to occur.

An agricultural economy is also essential to the second hypothesis. Agricultural production allowed a surplus of food to accumulate. It is very improbable that this would have happened in a hunting-gathering economy because in such a society a person gathered just enough to satisfy himself. With agriculture, a person with tools can produce more than enough food for himself with ease.

A surplus meant that not everyone was needed to work towards supplying the community with food. This gave some members free time in which to pursue other activities. As time progressed and the community became more sedentary, its agricultural productivity increased, due to the accumulation of better tools and knowledge. The man hours required to produce enough food for the community also decreased. The excess time allowed people to pursue activities besides agriculture. At some time agricultural productivity increased enough so that a group of people could stop farming all together.

These people, referred to as secondary population and the farmers and family as primary population, continued to follow the other pursuits. These ranged from making pots, to organizing, to fighting. these groups developed into various classes, i.e. artisans, administration, and a standing military.

It is the development of the standing military which is the most important to the topic because it has some interesting consequences on the primitive fighting. There is now a group who just work on the skills of fighting. They become proficient at fighting and begin to compete with each other. The concept of honor arises. Now it is not enough to drive away the opposition. The ideal is to capture them force them to work in your fields because "no one likes to weed the garden." (Clarkson)

There is a danger envoloved with this. The other bands are also going through a process similar. Thus these slaves are most probably members of a standing military. They, like your own standing military, are proud and honorific and thus do not like working in the fields. Every chance they get they will try to escape, or counter-attack, in an attempt to regain their honor. Look at the precaution Sparta took with their captured slaves: they knew, from direct experience, how dangerous warriors forced to be slaves can be.

What do you do with the opponents now? You cannot drive them away, because they will reattack in an attempt to regain their lost honor. You cannot use them as slaves, as explained above. So what do you do? Well, you kill them. They cannot cause you anymore bother if they are dead.

In fact this is what history shows. Large scale killing did not start until after the communities got too large to control efficiently and too dangerous to be left behind. (Dyer, chap. 1; Turner-High, chap. 3)

What needs to be shown is that this assumption of the secondary population coming about because of a surplus of food is plausible. To test this a STELLA

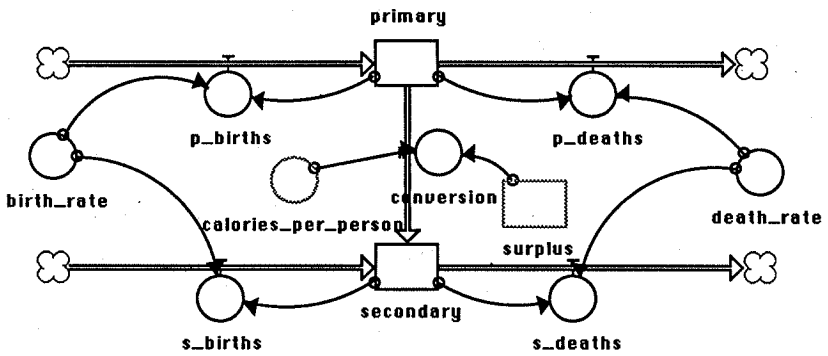

Figure 2

model was constructed. If the model could produce characteristics similar to historical data, then the above theory will be accepted.

The resulting model is depicted in Figure 2 and Figure 3. It is presented in

its entirety, but due to lack of space, neither the equations are present nor will I go through the model piece by piece. Much of it utilizes standard system dynamics techniques and thus is discernable. Yet there are some aspects which should be explained:

1) The Population section (Figure 2): The population is a co-flow consisting of the primary and secondary populations (**primary** and **secondary**). The initial value for secondary is zero to simulate a completely farming community, and to allow the secondary population to grow due to the surplus of food (measured in calories). The two flows are linked by the conversion flow, which is the number of people every year which becomes part of the secondary population. This rate is calculated by the number of people the surplus can support (**conversion = surplus/ cal_per_person**)

2) The Production/Consumption section (Figure 3): The production section is just the flow of food, which is measured in calories. The three levels look at availability of calories for the different strata of the society. Primarily the farmers and their families get first dibs on the calories produced, since they just kept what they consumed (**primary_calories**) and distributed the rest. What the farmers did not eat is moved to the others of the community (the rate **excess** to **secondary_calories**, where **excess = primary_calories - p_consumption**).

What was left after the secondary population ate is left over as surplus (the rate **excess2** to surplus, equation similar to **excess**) The surplus defines how many people give up farming and move to another occupation. The consumption from this level is due to those in the process of moving, thus a person can consume

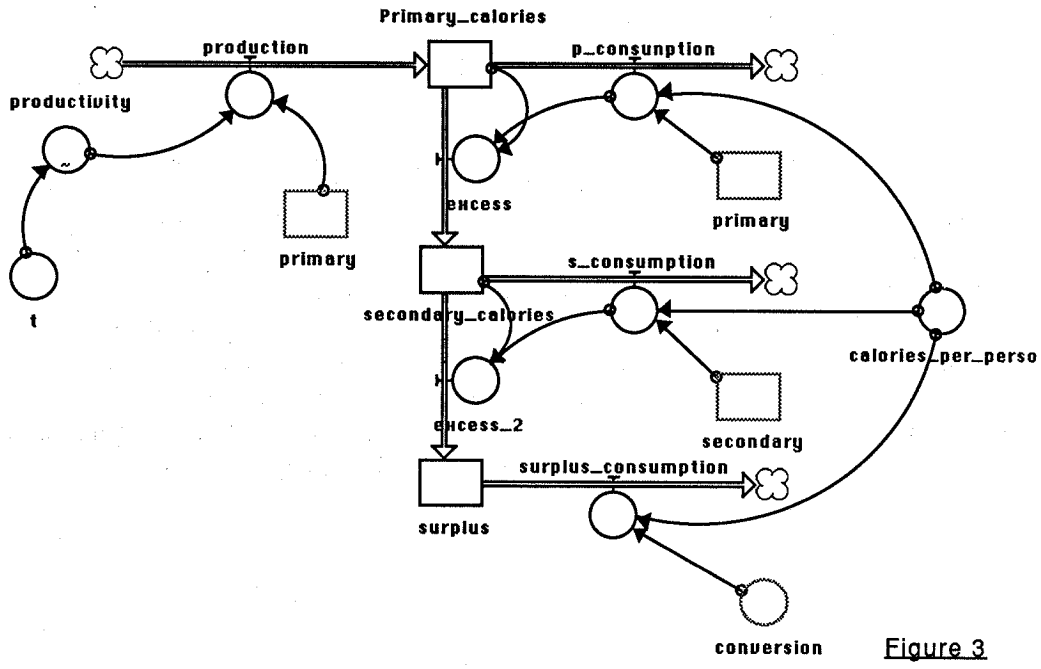

Figure 3

calories from the surplus only once, there after he/she is a member of the secondary population.

3) The values used in the final run are consistent with the available historical data. This includes all constants, initial values, simulation time and reference modes (see references).

To test the feasibility of the model, and therefore the hypothesis, two trends were examined, population growth (**total_population**) and the percent of the population which was responsible for food production (**percent_primary**). For the population we were looking for an exponential growth from 30 members to 100 members over the 1000 years. For **percent_primary**, a range from 100 to 75, again over the 1000 years, in a linear fashion.

The outcome of the model when it was run was surprisingly close to the

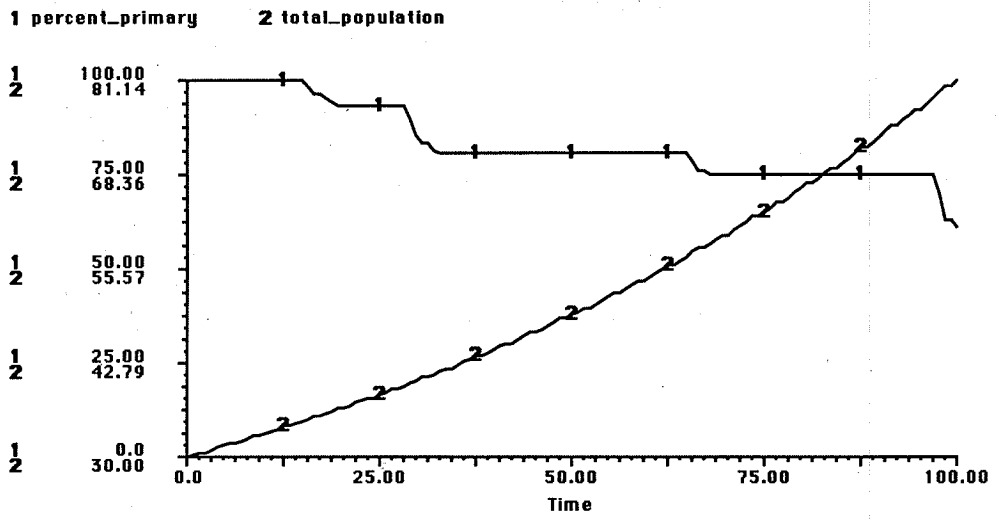

Figure 4

hoped for values, as shown by Figure 4. When the initial values were set to correspond with the reference curves the final values were: **total_population** = 91 and **percent_primary** = 61. This is sufficiently close to the reference mode to accept the model as accurate (9% and 19% difference respectively).

Since the results of the run are acceptable in respect to the reference mode, the theory can be accepted. The surplus created by an agricultural production allowed the existence of a standing military. Since their primary concern was fighting, and most of their energy was directed towards, the strategies and techniques of warfare emerged from this standing military.

Conclusion

The advent of agricultural production began a process which increased the sedentariness of the previously nomadic band. As a result of this sedentariness, there was an accumulation of durable goods as well as a willingness to defend the area of the community. This willingness grew to such an extent that the tradition of feuding was broken and fighting began.

Agricultural production also produced a surplus of food. This surplus allowed members of the community to do other things besides farming. What arose was different classes of people, one of which was a standing military. A STELLA model was constructed to test this hypothesis. The results were sufficiently close to reference modes, so the theory was accepted. With the establishment of a standing military, it is easy to see how warfare can be a consequence of this class of full time fighters.

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