Progress and the Pendulum Swing: Capitalism and Religion from the Roman Empire to the First Industrial Revolution *

By

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Abstract

Rejecting the view that capitalism emerged in the ancient world – in particular in the Roman Empire – this essay argues that capitalism only became entrenched during the first industrial revolution. It arose from progress both materialistic and idealist. Progress was generated by pendulum swings: in the material world; in the world of ideas. Pioneered by Axial Age Greeks - in the fields of religion, government and philosophy – these pendulum swings reverberated throughout the history of the West. Pendulum swings persisted in a Roman Empire that initially triumphed economically due to its mastery of predation. However predation feeds on predation. Political pendulum swings induced by competition between competing militarists, intellectual pendulum swings induced by competing religious views, haunted the Roman Empire. In a futile attempt to stabilize the empire, political elites installed Nicene Christianity as the official religion of an empire buffeted by military invasions from Central Asia; rotting internally due to civil wars between rival militarists. As the western Roman Empire disintegrated into fragmented feudalism, military overlords and kings shared power with a Catholic Church fending off rival forms of Christianity. Deeply divided by feuding between secular rulers and religious elites over resources, the medieval pendulum swung in favor of the church, bolstering its wealth and power. This induced a counter swing favoring kings, secular authority in general. The high medieval period witnessed the apex of these back and forth swings. It was a period exemplified by the clash over investiture and the call for crusades directed against the Muslim world. Ironically crusades initially instituted for religious reasons served to introduce merchant capitalism pioneered by the Islamic world into Western Europe. The resulting commercialization eroded the legitimacy of the Catholic Church increasingly buffeted by heretical movements disgusted with church corruption. Dissolution of church authority strengthened the hand of ambitious secular rulers. Out of this dynamic emerged scholasticism – a merging of ancient Greek and Roman thought with Christianity – embroiled in an intellectual battle against hermetic alchemy. Out of this dynamic emerged mercantilist governments struggling to wrest economic rents away from local economic monopolies. The resulting swings - over ideas, resources and power - laid the foundation for natural philosophy, technological capitalism, the ultimate merging of merchant and technological capitalism under the capitalist umbrella, and the first industrial revolution.
Table of Contents

Part I: Ushering in Christianity a Decaying Roman Economy Sets the Stage for the Pendulum Swing of Medieval Europe

Idealism and Materialism in Economic History
Axial Age Thought: From Heroic Myth to Social Control
The Pendulum Swing in the Greek Axial Age
Predation, Gift Exchange, and Markets in the Roman Empire
One God, One Emperor

Part II: Merchant Capitalism and the Pendulum Swing

Consolidating Catholicism and Feudalism: The Great Pendulum Swing of Early Medieval Europe
The Pendulum Swing of the High Medieval Period: Simony and the Crusades
The Pendulum Swing of the Late Medieval Period: Merchant Capitalism versus Feudalism, Catholic Church Inquisition versus Neo-Donatist Sectarianism, Scholasticism versus Alchemy

Part III: Technological Capitalism and the Pendulum Swing

The Pendulum Swing in Political Economy: Mercantilism versus Fragmentation
The Pendulum Swing in Natural Philosophy
The Pendulum Swing in the First Industrial Revolution: Scientific Ideas and Material Forces Conjoined
Conclusions
Footnotes

Appendix An Augmented Production Function Dividing Knowledge into Two Forms: Knowledge Embodied in the Qualities of Labor, Land and Capital; and Disembodied General Purpose Knowledge Taking the Form of Ideas

Bibliography
Part I: Ushering in Christianity a Decaying Roman Economy Sets the Stage for the Pendulum Swing of Medieval Europe

Idealism and Materialism in Economic History

Over many decades - I shudder to count them - I have labored under a fascination with the god Janus. Janus is an unusual Roman god, rootless in a way as he has no predecessors, finds no parallel, in Greek pantheon. Fanciful to be sure, a wild speculation might conclude the Romans conjured him up as if to say “see, we were beholden to you Greeks for your past achievements, but past is past. We, not you, represent the future.” Janus, head bifurcated, gazing simultaneously to the right and left, taking in both past and the future in a single sweep seems to impishly claim to enjoy two very disjointed worlds. Drawing upon the past he foretells the future. He is ancient; he is modern.

Perhaps Janus simply fascinates me simply because I am a scholar. I struggle to keep up in a field informed by a plethora of freshly minted publications. Yet I never forget that what seems novel and innovative, often as not seems a rehash of an older literature. More to the point I have come to a realization that some century-old scholarly debates linger on, perhaps clothed in new finery, undoubtedly invigorated by advances technical and conceptual, yet not so different after all.

Take the famous intellectual clash between followers of Karl Marx and Max Weber, between so-called materialists and so-called idealists grappling with the relationship between capitalism and religion.
Let me simplify the two opposing positions.

Both Marx and Weber were trying to explain the same thing: the emergence of powerful merchant groups during the 17th and early 18th centuries who acquired vast fortunes through global trade and diligent management of domestic resources – time, money, and political connections – paving the way for the first Industrial Revolution. Particularly successful in the transition from the Mercantilism of the 17th century to the industrial revolution were the countries steeped in Calvinism, notably Puritan England that emerged as the technological and international trade dynamo of the period 1750 to 1850.

Writing in the mid-19th century Marx argued that the transition from mercantilism to industrialization was driven by the primitive accumulation of capital. Under feudalism avaricious merchants accumulating capital managed to undermine feudal class relations, commercializing associations rooted in hierarchical obligations. On feudal estates military overlords extracted labor services from the serfs and peasants tied to their manorial estates. Successful merchants - acting as intermediaries between urban artisans producing luxuries consumed by the manorial overlords - built financial empires.

As Europe exploded out into global oceanic trade under the aegis of mercantilism, powerful merchant houses acquired monopolies granted by monarchs vigorously competing against one another in politically fragmented Europe. Establishing colonies in the New World, capturing oceanic trade routes, merchant companies chartered by crown governments exploited African slaves in amassing ever greater wealth. Capitalism emerged. To Marx who argued materialistic forces embodied in technological change and changing class relations, the
religious beliefs of the Protestant merchants were part and parcel of their “class consciousness,” their collective identity as it were. The political superstructure was erected on the backs of the material substructure. As merchants commercialized rural life they forced a reorganization of farming, promoting enclosures of land, driving off the impoverished peasantry who subsisted on the margins of the great estates, on the common land. Feeding off their economic exploitation of slaves laboring abroad in colonial possessions and a growing domestic proletariat driven off the fields, the class of merchants aggrandized power. Ultimately they funded revolutions dismantling decentralized feudalism, replacing it with bourgeois democracy which took the form of nation-states. Capitalism and democracy were inextricably linked. Exploitation of serfs under feudalism was replaced by exploitation of the proletariat under capitalism. Under capitalism merchants and entrepreneurs extracted surplus value over and above socially defined subsistence wages paid workers, echoing the mechanisms by which their feudal predecessors extracted labor services under feudalism.

Just as feudalism was vanquished by accumulation of capital in the hands of merchants, so would capitalism eventually give way to socialism, finally to stateless communism, in the hands of workers. Capitalism would be destroyed by the instability of the system. Capitalists would go on accumulating capital, particularly fixed capital that displaced workers. Workers would be made redundant by the force of accumulation. Thrown out of employment they would ultimately embrace revolution. Key to achieving this goal was the development of working class consciousness, a realization that they were being exploited diffusing its way through the rank and file proletariat.
Noting that established churches in the Protestant countries were justifying nascent capitalism on religious grounds, Marx denounced Christianity itself. Arguing religion is the opiate of the masses, he maintained that its seductive appeal to the downtrodden lay in dismal reality of lives barren of hope. Religion infused visions – visions of a future paradise in which the poor garner justice, embracing purity while the mighty of the world are brought low suffering cruel physical punishments in purgatory or consumed by the fires of hell; visions of an afterlife in a more elevated caste; visions of immaterial enlightenment sweeping away the dark fortitudes of bitter reality that is essence nothing but illusion; following the golden rule, worshipping your ancestors through elaborate rites and rituals, embracing virtue despite wallowing in poverty – these are smokescreens preventing the oppressed from facing the reality of their economic oppression. Religion must be opposed. It impedes the growth of class consciousness. It slows down the inevitable overthrow of heartless capitalism. Under a classless communism ushered when workers seized power, religious ideas become superfluous. They are no longer needed since the blinders have been pulled off the eyes of the workers. Religion should be done away with. Fighting it off goes hand in hand with revolutionary struggle.

To those captivated by Weber’s vision, ideas channeled through social institutions shape economic activity. Religious ideas – the cornerstone of culture, all communities on the earth having them in some form or another – are crucial to whether societies embrace long run economic development or flounder along the way. It was in the European West that the right complexion of ideas took hold. The crux is making a virtue out of saving and of working tirelessly and assiduously; accumulating financial resources that can be ploughed into physical
capital, worshipping efficiency; being as thrifty as possible with the time granted a person on earth; imbibing the doctrine that “time is money”, eschewing the expenditure of time on frivolous leisure activities; these ideas emerged under Protestantism, notably Calvinism. One’s future salvation, the hope of a heavenly afterlife, is predetermined despite all of our best efforts to influence the outcome. After all we mere defiled humans wallow in corrupting sin. How can we dare to know what a completely pure deity wants for us? By God’s grace and that grace alone are we prepared for salvation. God selects who is saved, who is damned. The community of the elect should display its exalted status through the rectitude of its disciplined behavior.

Duty, discipline, diligent time management: for Weber Calvinism was an eminently rational religion, relatively bereft of animistic thinking, of pointless ritual, of the very trappings of magic represent by the ceremony of the Eucharist that Catholic priests used to awe and inspire their flocks. By “demystifying” the world Protestantism opened wide the doors of thought to a decidedly opposed version of dutiful time saving toil, a secular version. Under secularization, obligation, guilt, obsessive concern with the relentless clicking away of valuable time became a routine laden “iron cage” applied to business, factory work, corporate and government bureaucracy. A deep paradox was afoot. A particular religion – not religion in general – ushered in its very opposite, secularism. Because the world was demystified, rational scientific thinking could flourish. The full scale bloom of modernization could assert itself, pushing its roots deeper and deeper into the social soil. Capitalism as a system went hand in hand with unrelenting rationalism.
In a nutshell – and for completely different reasons - both Marxism and Weber inspired analyses predicting religion would wither away as capitalism gave way to a non-capitalist future, at least in the West. For both schools of thinking the possibility that the triumph of capitalism might be limited to the West was real. For Marxian analysis the presence or absence of feudalism was crucial. Suppose feudalism failed to develop in India or China. Perhaps this implied capitalism would never develop in these arenas. For Weber the presence of religious traditions – Confucianism, Hinduism, Buddhism, Taoism, and Islam – that oriented devotees away from the type of rationalization of life key to Protestantism might well condemn them to a non-capitalist future.

When all of this failed to materialize – when non-Christian countries like Japan, China, Thailand, Indonesia, and Korea – either became capitalist or embraced communism, scholars scrambled to refashion their arguments. Fresh interpretations of idealism incorporating religion, its philosophy, bourgeois logic, came to the fore. Materialistic arguments flourished under new guises: Marxist inspired Frankfurt school thinking; Neo-classical economic arguments cast in terms of relative prices, income per capita, and wages; geographic or quasi-geographic formulations; and perhaps most intriguing, neo-Darwinian evolutionary thinking. The last line of argument attempts to explain why religions arise, the role they play in shaping economic behavior, and how it is that capitalism has become increasingly dominant first in the West triumphantly spreading out selectively into some regions and not into others, particularly flourishing in East Asia, The linchpin of the theory is reproductive success.
The argument about reproductive success builds on neuroscience and evolutionary biology. As its root is a problem Darwin struggled with: why are humans, and some animals, altruistic? If competition for resources is a totally selfish pursuit determining who has the greatest number of offspring surviving to maturity – lowering our mortality risks, lengthening the amount of time we can reproduce, bolstering our fertility - why do we go out of our way to assist others? One possibility is that altruism promotes group fitness, for example amongst hunters and gatherers rendering them more successful in the competition for animal prey and vegetation that competitor groups. Unfortunately for neo-Darwinists genetic transmission from parents to offspring – the Darwinian mechanism of reproductive success playing out at the level of DNA – is not a group phenomenon, it is an individual phenomenon. So why are humans relatively cooperative at the level of groups?

One solution is transcendental monitoring. As Johnson (2016) claims in his book *God is Watching You*, fear of divine punishment permeates all religions worldwide. Suppressing selfishness at the individual level enhances an individual’s evolutionary success. It reduces the probability that one will be physically punished, ostracized, or accused of wrong-doing by the group. If fear of cosmic retribution, if belief in a Just World, virtue being rewarded and criminality and non-cooperation severely punished - if not in this life but at least in an afterlife - is sufficiently widespread in human populations, most people will suppress their selfishness. But why should that come about?

One line of argument involves recent research on the brain. The idea here is that there are two systems active in the brain. One is the BAS (behavioral approach system). Fueled by
what we call positive feedback, it is what we have in mind when we talk about carrots as
opposed to sticks. The other system is the BIS (behavioral inhibition system). This system feeds
off of threats, negative sticks if you will. According to neuroscience learning tends to favor the
BIS system at the expense of the BAS system. The better educated we are, the more likely we
are to favor punishing others. In human populations that enjoy the use of symbolic language -
spoken as well as symbolic body language (crossing our arms is a sign of disapproval as is
scowling and rolling our eyeballs) – informal education takes place in all households, in all
groups no matter what is the technological basis for production of goods and services. In short
punishing comes natural to us. It is innate. This might explain why we are cooperative. We
punish free-riders and malcontents. We make it possible to cobble together public goods
beneficial to all of us, albeit the rewards may be captured by some persons in society and not
by others.

Behavioral psychologists have weighed in on the issue of transcendental monitoring. 
Consider the findings reported in Norenzayan (2015). Based on laboratory experiments carried
out at the University of British Columbia, participants being primed – or not primed depending
on the experiment involved – by religious statements before their behavior is observed,
Norenzayan draws a variety of conclusions that he highlights in eight mantra-like assertions.
These are: watched people are good people; religion is more in the situation that in the person
(we are more altruistic on a day when we attend church, synagogue, or mosque for instance);
Hell is stronger than Heaven (fear of divine punishment trumps fuzzy feelings of being loved by
a benevolent cosmic force); we trust people who trust in God (atheists are distrusted because
they are likely to be free-riders, deterring from group objectives); religious actions speak larger than words (advertise your faith by living it); unworshipped Gods are impotent Gods; Big Gods for Big Groups; and religious groups cooperate in order to compete.

For materialists evolutionary claims about religion make for good reading. Groups that do not develop Big Gods remain small. Only those that manage to turn ritual, magic, poetic expression into the service of Big Gods move on successfully from hunting and gathering to settled agriculture with domesticated plants and animals. Ideas are rooted in evolutionary advantage, explicable in terms of the structure of the human brain.

As appealing as the thesis is, I must demure. Is there not an infinite regress problem here? Do you not have to be fairly cooperative before you can agree on the nature of the Big God? Moreover what if some people promote a particular god and another group advocates a competitor deity? How do you reconcile that? Materialism overreaches. Ideas matter independently of material forces.

If both material and intellectual forces shape history both followers of Weber and of Marx might be right on some points albeit off base on others. In point of fact there are good reasons for thinking that both Marx and Weber were dead right in some areas. For instance according to my lights Marx was correct in analyzing the instability of capitalism; he was right in associating capitalism with the late eighteenth and nineteenth centuries. Again I believe Weber was astute in linking religious thought to capitalism; he was right in arguing that scientific thinking was important. Taking the position that both approaches have bite is tantamount to saying that both material and idealist forces interact in some way. However going down this
road means we must come up with crisp and clear definitions of capitalism and religion. Why? Because fuzziness in defining capitalism and religion opens up a rancid can of worms, scholars arguing with one another without establishing ground rules for fruitful debate.

With this in mind I give two definitions. I define religion as purification buttressed by faith not fact. I define capitalism as the mobility of capital buttressed by credit creation.

In formulating these definitions I rule out associating capitalism with the operation of relatively unfettered markets. I rule out capitalism being conceived of as a system in which an elite group garners income from ownership of capital and land while the non-elite group earns income from labor service, wages for instance. I rule out capitalism being defined in terms of private ownership. For instance state capitalism flourishing under communism, in principle the state being the possessor and manager of capital as a public good supposedly administered in the interests of workers is still capitalism according to this definition. Marx, operating with a teleological theory of progress, assumed that trade created social surpluses. In turn a significant slice of these surpluses were captured by merchants who transformed the surplus they extracted into physical capital in the form of machinery, structures and transport vehicles. If the state secures ownership of capital, wresting it away from the capitalists, it can turn surpluses into physical capital just as well as the private market can. And it can do so without fomenting unemployment provided it sticks to a general full employment plan formulated by state officials, bureaucrats.

What I find compelling in Marx’s vision are four ideas: capitalism is decidedly modern, asserting itself at the time of the first industrial revolutions, that is after the mid-18th century;
capitalism is unstably, generating booms and busts, downturns spawning unemployment; religion has been, and in some regions of the globe continues to be, a powerful agent of social control that ruling elites wield at the expense of the poor; and dialectic opposition does spawn progress over the long-run. For instance, in my framework dialectics are interpreted in terms of the pendulum swing.

That said, I reject Marxist theory on many grounds. I reject the idea of class altogether. Ironically it is an “ideal type,” smacking of the very idealism Marx angrily derided. The problem with “ideal types” is they mask heterogeneity. I believe heterogeneity is crucial to progress in both material and idealist arenas. For instance invoking “ideal types” – as proposed by Akerlof (1984) and by Akerlof and Kranton (2010) who basically divide populations into insider/outsider groups – is vitiated by its appeal to two homogeneous groups. In Akerlof and Kranton (2010) we have a ethnically defined group - say African-Americans socialized one way – interacting with homogeneous group of non-African-Americans socialized another way. Surely this is smacks of simplistic thinking.

The idea that two homogeneous groups contest against one another over power and economic resources or dispute with another over ideologies does not preclude heterogeneity. Indeed it is my argument that competition between two “big tent” alliances - each composed of individuals advancing their own disparate ideas and economic interests – is often the generator of progress over the long-run. The point is there is heterogeneity within the two opposing groups. It is in the interests of heterogeneous individuals joining a group to combine forces with colleagues who may differ on some points but in the overall picture are natural allies. Without
likeminded friends, an individual’s hope of achieving any kind of lasting success is doomed, crushed like so many wrinkled up plastic coffee cups. Join a group of individuals sufficiently similar in beliefs and material interests, acting as a group permitting you and your colleagues to illicit the muscle necessary to successfully combat those individuals you oppose. According to this logic heterogeneity is consistent with analysis ultimately based on a kind of binary dialectic.

Moreover, I fail to see how a theory postulating capitalism emergent out of feudalism accounts for what happened in the western world prior to feudalism. A great empire, the Roman Empire, collapsed in the fourth and fifth centuries, ushering in decentralized feudalism and Christian hegemony. However, while in its heyday – from the last two centuries BCE until the end of the second century CE - the Roman Empire was cohesive and large. It spawned specialization and division of labor; it made use of slavery; its impressive road network promoted comparative advantage etched out along far-flung trade routes. In short in so far as Marx’s theory rests on the idea of expansive markets and the exploitation of an underclass giving rise to a social surplus that merchants can extract, making it the basis of primitive capital accumulation, one must ask: why did capitalism only come into its own in the eighteenth century? Why was it not firmly established under Roman rule?

Likewise I find much in Weber that is admirable. I do agree that science coupled with demystification of the world was crucial to the triumph of capitalism. I do agree that religious ideas coming down from the ancient world were crucial to capitalism as a system of ideas for rationalizing economic production.
As with Marx, however, I must interject criticism, I must demure on many points formulated in Weber’s approach. I sincerely doubt that Christianity had much to do with capitalism. In fact the originator of the doctrines that Calvinists so devoutly embraced was Saint Augustine. Augustine was writing in the fourth and fifth centuries as the Roman Empire was disintegrating, pummeled by repeated attacks by Visigoths, Ostrogoths, Lombards, Alamans, and Vandals. In the tract that laid down one of the key ideological cornerstones upon which medieval Catholic Church doctrine rested – *The City of God and the City of the World* – Augustine of Hippo advanced a theory of deterministic predestination. God had selected some for salvation. On these he dispensed grace. On the rest of the world He withheld His grace. Some people in the church would be saved; some would not. Who knew whether a diligent churchgoer was one of those selected for salvation? Some people active in the city of the world would be saved. Who knew what their fate was to be? There were two separate worlds: one secular, the other religious. Those destined for salvation - regardless of which world they were active in - would find their souls happily ensconced in the presence of their God when their material bodies perished, leaving nothing more than a soul. Those fated to be damned would not be so lucky. All of this was based on a deterministic theory of predestination, the ultimate basis for the crucial tenets of Calvinist Christianity that flourished in the sixteenth and seventeenth centuries. Were they new? No. In point of fact these ideas were alive and well during the waning decades of the Roman Empire.

What did the church, ostensibly committed to Saint Augustine, do with the idea of the soul finding itself once freed of sinful flesh looking to enter Heaven or be consigned to
damnation? What the church did with these concepts we know. It fashioned a theory of purgatory. Remarkably purgatory became a huge money maker for the church itself. It allowed the church to acquire vast tracts of land, to hire mercenaries to fight for it, to contest power with secular authority, to twist the arms of kings lusting for the glories of armed combat.

The argument I make in this paper is simple. There was a set of ideas firmly established in the ancient West that ultimately shaped progress leading to full blown capitalism. These ideas were not Christian. They were Greek. They involved what I call the “pendulum swing,” an ongoing dialectic in the intellectual world encompassing religion; in the material world involving social organization, military affairs and government. For a while one school of thought would prevail. Its opponents, having girded their loins, actively opposed the prevailing doctrine, perhaps winning out, perhaps not. Out of the passionate clash of principles understanding deepens on both sides. Progress takes place. Central to the Greek “pendulum swing” is the fact it took place in parallel worlds: the world of ideas; the world of material forces.

Had the pendulum swing been active only in the world of ideas it is my assertion that the western world would not spawned scientific progress and radical experiments in government. Without the scientific progress acceleration in innovation, characteristic of the first industrial revolution would not have taken place. Capital would not have become increasingly mobile bouncing around between sectors, seeking its highest rate of return. Key to the pendulum swing in the West is that it never ceased even after the Roman Empire collapsed. It continued to inform historical change during the medieval period, during the seventeenth
century era dominated intellectually by natural philosophy, during the eighteenth century Enlightenment, and during the first and second Industrial Revolutions.

Axial Thought Traditions: From Heroic Myth to Social Control

Religion exists in all societies. This includes hunters and gathers.

Amongst hunting and gathering populations, religion is the amalgam of magic, ritual, taboo, totemic beliefs, fear of ghosts and reincarnated ancestors, altruistic sacrifice for the greater good of the tribe, the feeling – induced by consumption of drugs or participation in frenzied dances - of being possessed by supernatural spirits, and animism. Lacking hierarchy – groups are small, specialization of tasks is not well developed – no formal priestly class, no chief lays down a rigid set of rules governing religion. In a world frightening because wild animals – bears, tigers, venomous snakes - might pounce on the unsuspecting person, in a world in which other hostile tribes might attack, it is better to assume the worse rather than naively cling to illusions. Acquiring protection for magical figurines, listening to wise tribal elders suggesting what colorful and elaborate purifying rituals will ward off demonic predators, tribal members weave their way through a myriad of beliefs that serve their interests as individuals. As well the beliefs contribute to the security of the group as a collective whole.

Not surprisingly purity is associated with the sky, with the sparkling stars at night while earth – where the dead are buried or on which their corpses are burned – is conceived of as defiled. This is animistic thinking, assigning ethical judgment to inanimate objects. To be sure tribal groups possess an intuitive understanding of physics and chemistry. But in the absence of
mechanical devises for probing deeper into the nature of their physical environs, animistic beliefs are the default option.

More generally purification lies at the root of all aspects of tribal religion. Shielded by magic, warned off of incest by taboos, inculcated into adulthood through rituals designed to mold the young into the mores surrounding hunting, storage of food, and the spawning of offspring, tribal members encounter religion as a relatively disorganized system of practices and beliefs.

All of this changes when two things happen to a group: either it settles down or it wanders moving about with its horses and sheep. In the settler case it grows in size because it adopts settled agriculture with domesticated plants and animals. Population grows as land is converted from marsh, forest, and fen into enriched cultivated land supporting grain fields and yielding sustenance to domesticated cows, sheep, goats, pigs and chickens. The carrying capacity of the land improves. Reaping a generous surplus far larger than was possible under hunting and gathering, a surplus that elites covet and attempt to monopolize, clearly etched hierarchy emerges. This is the sedentary outcome. Alternatively the group remains nomadic, carrying on warfare and trade as two means for generating wealth. In both cases chiefdoms arise. Hierarchy is established, status exercised around systematized rituals and beliefs. Trade between the two groups enhances wealth creation in both zones.

In the Appendix I develop a production function methodology that can be applied to analyzing the transition from hunting to gathering to settled agriculture (enhanced by trade with nomadic chiefdoms), to the Roman economy, and to the first industrial revolution. For the
reader phobic to mathematical symbolization, let me say: please skip the equations if you must; but at a minimum please read the text that describes the concepts captured in the algebra.

Returning to chiefdoms, how do they control their populations? While chiefs have a variety of mechanisms by which they can justify their special status, two stand out: gift exchange and claims to divinity. Elaborately conceived gift exchange, in which the ruler differentiates between the more favored and less favored, effectively ostracizing malcontents, currying favor with priests and warriors who assist him or her in ruling is one option. Another is enveloping oneself with the trappings of heroic status. Claiming to possess transcendental powers permitting the anointed one to fend off demons, ghosts, hostile tribes, and the capacity to point the group in the direction of purity is an attractive option. In point of fact gift exchange and claims of divinity usually go hand in hand. Through his devotion the ruler receives gifts from the transcendental world benefitting the groups as a whole, for instance warm weather, an early spring beneficial to grain planters, an abundant harvest speaking to those raising cattle, goats, sheep and horses. As ruler he or she carries out – along with priests appropriately purified, sanctified, robed in regal vestments and jewels – purifying rituals designed to encourage benevolence on the transcendental spirits. One way to do this is the blood sacrifice, the offering up of humans as a way to mollify the gods.

Along these lines consider the basic myth basic of the Central Eurasian Complex characterizing the chief of a nomadic group. It is the story of a hero:\n
“A maiden is impregnated by a heavenly spirit of god.

The rightful king is deposed unjustly.
The maiden gives birth to a marvelous baby boy.
The unjust king orders the baby to be exposed.
The wild beasts nurture the baby so he survives.
The baby is discovered in the wilderness and saved.
The boy grows up to a skilled horseman and archer.
He is brought to court but put in a subservient position.
He is in danger of being put to death but escapes.
He acquires a following of oath-sworn warriors.
He overthrows the tyrant and re-establishes justice in the kingdom.
He founds a new city or dynasty.”

Loyalty unto death was central to the early Central Asian Culture Complex. The oath-sworn friends of the hero were prepared to die for their lord. Even more striking, in the institution of the comitatus, the Praetorian guards, the defenders of the hero were prepared to commit ritual suicide if the hero preceded them in death. The Japanese *samurai* who were heirs to the Complex knew this principle. They channeled it through the concept of *junshi*. Loyalty trumps everything else. A completely loyal retainer proves steadfast devotion by following his lord into the grave festooned with his weapons and riches.

Why embrace this horrid fate? The answer is riches, gift exchange: silk robes laced in gold, jewels, a luxurious life enjoyed in the palaces maintained by the lord. Indeed this was the key to trade on the Central Asian steppes: the comitatus carried on trade in order to secure the beautifully crafted ornaments produced in the civilizations that had embraced settled farming. As well the bond between chief and retainer ran deep. It gave purpose to life. In any case a life
spent surrounded by riches was superior to scratching out a penurious existence in villages
strung across the vast semi-arid interior of Eurasia.

All of this made Eurasian wide trade both mutually advantageous and potentially
dangerous. The nomadic comitatus braved the great spaces stretching between the
Mediterranean and the Great Wall of China. Either individually or in federations, fighting off
raiders, the comitatus struggled across frigid steppe lands, over parched deserts, passing
through snow covered forbidding mountain passes. All of this to offer up horses, silk, pearls,
golden goblets, gems, silver bullion to the elites ruling the great agrarian empires of Eurasia
whether Greek, Parthian, Indus Valley, Chinese, or Roman. At the same time if challenged, if
insulted, the comitatus was fully prepared to harass, exhausting their trading partners with
feints, bloody incursions, along the string of frontier outposts where goods were bartered.

In short, blood sacrifice was integral to the Central Eurasian Culture Complex.

In settled agricultural societies blood sacrifice was practiced as well. Often it was tied to
worship of the great hero who acted as intermediary between deities and the humdrum world
of farmers. When Chinese emperors died perhaps twenty or so subordinate officials would give
up the ghost along with him or her; when high level officials perished perhaps five or six
followers would die. Into the tombs would go many bodies; into the tombs would go silks,
swords, and golden trinkets.

That blood sacrifice rituals became emblematic of such societies in no way ruled out
magic, belief in ghosts, the importance of oracular prediction, the search for miraculous cures
from debilitating diseases, spirit possession and the like. Rather these practices and beliefs co-existed with hero cults or were incorporated into hero cults by priests and officials working under the direction of rulers.

The early heroes of the Axial Age – the period between 1500 BCE and 0 BCE – bridge the gap between the divine and the human.³ Achilles is born of a god and a woman. Jacob wrestles with divine angels. Moses spends time with Yahweh on the mountain, receiving the divine law. The Yellow Emperor in China slays dragons. The Japanese emperor is descended from the sun god. The pharaohs are gods. The god Krishna advises the warrior Arjuna. Bridging two worlds – polluted daily reality punctuated by earthly pain, famines and floods, physical ailment and cruel death – and the purified existence enjoyed by gods who never die and timeless principles that never fail – mythic heroes celebrate the achievements that can be won by inspired warriors, prophets and priests. In short the early myths of the Axial Age - often as not initially spoken, recited over and over again by elites enjoying sufficient leisure to devote themselves to the transcendent – celebrate the military feats of peoples who manage to defeat rival claimants to territory, rationalizing their success by glorifying the special relationship between their military leaders and the transcendental world.

That these primal myths of the Axial Age were elaborated during the period 1500 BCE to 0 CE is not surprising. With the transition from the Bronze Age to the Iron Age warfare was revolutionized. Conflict between the sedentary civilizations adopting settled agriculture (investing in fixed capital, building irrigation systems and road networks and walled cities) and the nomadic peoples who carried on long-distance trade that could turn plunder in the twinkle
of any eye, intensified. Threatening the great agrarian civilizations as they came swirling out of the steppes riding on spoke-wheel chariots the trader-warriors of the Eurasian land mass were prepared to trade horses for elegant textiles, for golden goblets, for jewels. These were the chariot riders celebrated in the *Rig Veda*. Treated with disrespect they could turn dangerous, seizing territory, unseating rulers, and trashing temples. No wonder the Vedic literature makes repeated reference to the horse sacrifice. The horse epitomized steppe wildness.

The age of chariot warfare was bad enough. But it was nothing compared to the threat they posed once the Iron Age promoted advances in archery. By 1000 BCE merchant-warriors could flex their muscle massed in huge cavalries. With the onset of the Iron Age the technology of warfare took a leap forward. A small bow – the “cupid bow” – coupled with cast bronze arrowheads produced on mass basis according to standardized weight and size – changed all of this. Arrows were simplified and streamlined. Armed with a small bow that could be flexibly operated by archer riding atop speeding horseback the trader-cum-warrior was able to dispatch metal tipped arrows in three directions: left, backwards and forward. Unified into armies through bonds of sworn loyalty to powerful chieftains who entered into alliances of convenience with potential rivals, the long-distance merchant band was capable of carrying goods between the eastern and western reaches of the Eurasian land mass. Good for trade to be sure. But at the same time the efforts of these steppe warriors created a whole new set of political problems for the great agrarian civilizations.

To protect themselves against invasions from the hinterland the rulers of the agrarian states began to flex their military muscle. They exploited their natural advantage – population
size and the size of their social surplus – in an attempt to maximize their security. They pushed out in the borderlands threatened by invasions from hostile trader-warrior groups, defeating these groups whenever they could, incorporating them into their domestic fold if necessary, or paying appeasing tribute to buy peace. Of course all of this required resources. As the length of borders grew so did protection costs. Along sparsely guarded borders the nomadic groups enjoyed the advantage of mobility, the capacity to attack at the weakest link along the security chain.

As their empires expanded - in size, in the diversity of their economic specialization, and in religious complexity - so did the challenge of securing social control over the peoples over whom they ruled. For rulers using religion – originally shrouded in the myth of the semi-divine ruler-hero but co-existing with a long list of subordinate cults and practices – served as a convenient mechanism for solidifying control. Indeed had religion not been co-opted by the rulers attempting to fashion large empires it is difficult to see how they could achieve their goals of consolidating control over large and expanding states. What they had to do was “mask” their draconian systems of rules and regulations – putative legal systems – behind the claim that their rule was sanctioned by transcendental forces.

Axial Age China offers an illuminating illustration of this “masking” principle. Three belief systems contended for ruler support during the period when states competed for hegemony over China: Taoism, Confucianism, and Legalism (Realism). Taoism was mystical. It was grounded in the Way of Nature, in a belief that artifice would always fail, that minimal
government offers the best rule, that cultivating the pure soul was the best way to live life given the other options 7:

“The crowd cares for gain/the honest may for fame/the good man values success/but the Wise Man his soul.”

The Taoists were monk-like. In their Ideal State there would be no books, no records save knotted ropes, no machinery, no desire for splendid clothing, and only the simplest of foods. They mocked the Yellow Emperor who “was the first to tamper with men’s hearts when he taught goodness and duty.” According to the Taoists the last thing you wanted to do was tamper with the hearts of the people.

This was mysticism. Possession by the natural gods; sheer reliance of the yin and yang principles that undergirded nature itself; rejecting war because it could never achieve its putative ends; in short Taoism – which at the level of local communities promoted magic, yoga practice, the integration of physical motion with meditation – rejected the myth of the Yellow Emperor. It expressed one end of the heterogeneous religious spectrum.

Confucianism was a contender, rejecting the mysticism of Taoism, rather glorifying the principles of goodness and duty supposedly promulgated by the Yellow Emperor and followed by a few righteous rulers contending for control over China as a region. For Mencius virtuous rule – benevolence, concern for the fate of subordinates – was the keystone of a good state. Proper observance of rituals – particularly rituals surrounding the death of parents – was essential. If rulers followed the “three years of mourning” upon the death of a parent (especially a male parent), burying the dead with subordinates killed as blood sacrifice, they
would be following a Mandate of Heaven. If the rulers were benevolent, the common people would prosper, and they too could follow the duties surrounding the deaths of their parents. To purify in the face of death the Confucian school recommended abstaining from sex, living near the tomb of the deceased in a makeshift tent, adopting a dejected face, in short engaging in exaggerated mourning aimed at displaying conscientious respect for the ancestors. In this school ritual and mollification of the deceased (presumably motivated by fear of ghosts) was paramount. As a practical measure for imbibing the appropriate doctrines, the Confucian school rejected the nihilism of the Taoists, arguing that study of the appropriate written classics was the way to be truly virtuous, truly pure.

The third school – known as Fa Chia (Rule of Law) rejected the mysticism of the Taoists as anarchy and the idea of benevolence as naïve. Rulers needed to be tough; people could not be trusted. They must be organized into groups that would monitor each other, mutual espionage being the best way to suppress rebellion, to fasten tight a lid over the boiling pot that was society. Excessive ritual like the “three years of mourning” was wasteful of wealth and human talent. Blood sacrifice was unnecessary and unwise because potentially valuable lives were being lost. Spirits were afoot across the land and should be placated lest they stir up discontent amongst the masses. These spirits were either sent down from heaven; inhabitants of the hills and waterways; or ghosts of dead humans. The Code of Law must be completely transparent and long, regulating lives in great detail. To the extent possible resources must be preserved – the allocation for military preparation maximized – so that the state is ready to fight off contenders at all times. The plea of the Confucians to follow in the footsteps of ancient
kings is naïve because the ancient kings did not have at hand the type of war-making technologies now available to rulers.

Faced with the choice between these three schools of thought Chinese rulers ultimately elected to pursue Legalism or Realism in practice, masking it behind Confucian principles. In doing so they solved one of their chief problems: making sure their subordinate officials carried out the administration of laws in a forthright way. In so far as an official were trained along Confucian lines the official believed that a fellow official might be truly committed to Confucian rectitude. You do not know for sure. This doubt discourages officials from forming groups that decide to systematically lie, systematically deceiving higher ups. In no way does this policy completely suppress corruption and injustice taking place at the local level. But it does reduce corruption and malfeasance over all. It is a second best solution to the problem of how to formulate and fairly administer a set of laws that are draconian in fact, not in outward appearance. After all accusing one of the little people of violating the “Mandate of Heaven” is a powerful threat that can be used to suppress rebellion and discontent.  

The idea of religion masking draconian rule works for most of the great Axial Age traditions but not for all of them. How do you employ the ancient myths in which heroes interact with the pure transcendental world in order to secure cooperation of, and acceptance of poverty for, the masses? In the Chinese case we see one option: masking draconian rule under the guise of benevolent Confucian principles. In Hinduism the spread of the caste system offers another option. According to the “Poem of the Primeval Man” a cosmic giant, the Primeval Man, consisted of four parts. Dismembered it broke into four parts. The mouth
became the priests (Brahmins, the experts in sacred knowledge); the arms became the Raja (Kshatriya, the class of warriors, police and kings); the thighs the common people (Vaishya, farmers and merchants); and the feet, the lowest and least pure, the closest to the polluted earth the servants (Shudras, the outsider class). Spreading out into the concept of caste, this system of belief created a social order that could and was rationalized through the idea of \textit{karma} linked to rebirth through transmigration of the soul. If you were situated at the bottom of the hierarchy in one’s current manifestation on earth, practicing virtuous behavior rewarded you with good \textit{karma}, opening up the possibility of your righteous soul occupying a higher caste status in a future life. Being virtuous now, being cooperation and accepting your lot in this life, could keep you from being reborn as a worm, a beetle, a wasp. At the local community level the elite Brahmin castes could exercise harsh control over the lower castes if need be. In any case the \textit{karma} principle suppressed outbreaks of discontent on the part of the lower orders because the downtrodden occupied the bottom of the social hierarchy where the incentive to abide by your caste destiny was the strongest.

Before we turn to the Greek tradition it is useful to summarize what we have argued about the changing role of religious thinking in societies transitioning from the era of mythic hero-gods to ones regulated by religiously inspired laws and social codes.

Transcendental monitoring remains in force. The deities and heroes of the mythic stage of organized religion are bloodthirsty. Blood sacrifice is rampant at this stage. The gods often as not are warrior gods, they facilitate conquest over hostile forces. Fear of these gods or the divine principles based under belief in the gods goes hand in hand with fear of retribution by an
all seeing force. In short, fear of punishment is a hallmark of these faiths. Insofar as fear of being punished by cosmic forces encourages cooperative behavior, the costs of shaping social control born by ruling elites fall. Cooperation won through this means does help explain why markets develop during the second phase of the Axial Age, at least in cultures that managed the transition to an Axial Age belief system.

Gift exchange plays a strong role: in Hinduism the Brahmins are the agents of this exchange, mediating with the divine; in the Chinese case, Confucian officials learn how to practice benevolence in administering government justified by the Mandate of Heaven. However one form of gift exchange – blood sacrifice – becomes increasingly unimportant over time. It is too costly. It is largely relegated to execution of enemy combatants. In its place emerges the widespread practice of animal sacrifice. But even this is costly. Eventually it takes on less and less costly forms: abstinence from food consumption at stipulated times of the year being one example.

Religious diversity is important. Consider the Chinese case. Mysticism and magic mix with possession by the divine: seen as either a good thing (say by Taoists) or a bad thing (say by Legalists or Realists). In the Hinduism case the Brahmins who carry out religious rituals – denied completely to the lowly abused Shudras – can pursue mystic union with the godhead or stick to magical incantation. Moreover, for the lower castes the option of becoming a mystic in old age, renouncing materialism altogether, seeking union with the divine, practicing yoga infused meditation: all of these became options as Hinduism into a mass oriented religion in India. For a religion to persist as a successful social control mechanism for large hierarchical societies it has
to be “big tent”. It has to accommodate diversity of expression. Mystics, magicians, governors and rulers, elites and non-elites have to co-exist. Those who want to nourish the soul in mystic union with the divine; those who want a god or religious principle to punish the wicked and reward the pure in heart, virtuous person; those who want to practice magic, dispensing hope and amulets to those aggrieved by tragic deaths of children infected by typhoid, rheumatic fever, or dysentery; all of these disparate groups live chock a block with one another in the same community.

Where does this diversity come from? Why does it raise its ugly head, churning up treacherous wakes dispelling the myths of “ideal” types? It comes from diversity in temperament, personality, intelligence, and passion. The Axial Age Taoists explained it in terms of yin (negative/dark/feminine) and yang (positive/bright/masculine) mixing in different proportions. Hippocrates imagined it came from combinations of blood, yellow bile, black bile, and phlegm coursing through our physical bodies. Doctors needed to pick up the cues: too much yang might generate fevers just as too much light shining on a glass plate generates heat; too much blood might require blood-letting to restore balance in the humors. Today we speak of anxiety disorders; of hyperactivity; of clinical depression; of anorexia; of insomnia; of paranoid symptoms; of sociopathic personalities. We diagnose development disorders in our offspring with terms like autism and aspergers syndrome. We have concocted pills and licensed therapies to cope with this diversity of conditions. The point is diversity exists. Whether it is the product of nature – hard-wiring in our brains and nervous systems – or nurture is a matter of on-going debate. That diversity exists is not a contentious issue.
A third feature of social control religion is resource based. Advertising is crucial for successful religions. They need to appeal to their members through structures, symbols, public rituals. To accomplish this they need capital. They need financial backing whether it comes in the form of hard currency; endowment of land and structures; free labor; or jewelry, stained glass and sumptuous embellishments for the walls of religious structures.

Finally each of these religious systems has to deal with non-believers. Consider gift exchange. A member of a religion gives resources to a priest who intermediates with the transcendental world. How to you know he – or she – does what you ask? More to the point gift exchange can easily slip into bribery. For this reason societies in which religious gift exchange is extensive tend to be corrupt. Bribery goes hand in hand with gift exchange. Not surprisingly skeptics emerge, disgusted by the corruption. That is one problem. Another problem is religious diversity itself. Schisms are fomented: sects develop, splitting off from the main branch of a faith, spawning new variants. How do you know what is the true practice for the religion? Maybe, you say, nobody knows. Maybe you say atheism is a better option. By atheism here I mean two types. Rejection of a particular set of deities or cosmic transcendental principles: this is atheism particular to a religious setting. A second form is general atheism. You are anti-theistic. You reject the idea of a transcendental world altogether. Thorough going materialists can – but do not have to – fall into this category of atheism.

To be sure authorities – religious, secular, or both working in tandem – can suppress skepticism and atheism in both of its guises. They must use resources to do so. Religious police in theocracies play this role: witness Iran and Saudi Arabia. Secular police in contemporary
China do this as well. In China the target is opposition to the Communist party and its authoritarian ideology. You can do this. But it requires resources: loyal labor for one; intelligence gathering takes people; how do you trust the information culled by the intelligence gathers? Could they be deliberately lying to you? That is another problem.

**The Pendulum Swing in the Greek Axial Age**

With these points in mind let us turn to the ancient Greek Axial Age.

Greek religion – more generally Greek philosophy – is a synthesis, drawing on diverse traditions. Egyptian, Hittite, Persian, Mycenaean, Phoenician influences abound. A rich metal alloy fused from many minerals. Yet at its core is Proto-Indo-European myth. It shares much with early Axial Age Hinduism, particularly in its early stage. Zeus, head of the Greek pantheon is a sky god, sending lightning bolts down onto the earth. Indra, the king of gods – whose heroic presence shows up in the Hittite religion as early as 1400 BCE as well as in Indian Vedas – is a rain god, a warrior god, a slayer of the dragon Vritra. Prometheus, defying Zeus, is the self-sacrificing deity who provides humans with fire; Agni, god of fire in the Vedas, carries oblations from humans to the gods.

In the primordial sagas of both Greeks and Hindus heroes and gods are ever so close to one another, some heroes even being begotten by divine creatures, some gods even shedding their immortality to die like humans. Achilles, born of goddess, dares to defy Apollo, arrogantly rages at the Olympians yet ultimately perishes as a human. The Vedic god Krishna is wounded as a mortal would be, perhaps – depending on the version – dying of old age or leaving the
world by withdrawing his divine powers. The Vedic poem *Ramayana* tells of a great journey by a princely hero Rama who travels in southern India, fighting a world shaking battle against Ravan in Sri Lanka, losing his beloved wife Sita on the way, continuing tested in bloody confrontations. This parallels the *Odyssey* recounting the adventures of Odysseus returning to his loyal wife. On the way he fights off the monstrous Cyclops, avoids the seductive singing of the Sirens, passes through the treacherous waters lying between Scylla and Charybdis, finally dispatching to the underworld the suitors to his wife in a blood stained finale. Again the Vedic poem *Mahabharata* centers around bloodthirsty battles, two groups of warriors fighting for hegemony – at its most dramatic in the famous sequence in which the god Krishna, in the guise of a chariot driver, advises the warrior Arjuna to do his duty despite understanding how meaningless is the bloodshed - paralleling the *Iliad* that seemingly throws up its hands at the tragedies war brings. As well the *Iliad* illustrates a deep aversion to human blood sacrifice in the tragedy of the House of Atreus. In order to launch his great fleet aimed at destroying Troy Agamemnon sacrifices his daughter Iphigenia. Upon his return his wife Clytemnestra takes her vengeance, dispatching him in a pool of blood.

Interestingly enough the evidence suggests both sets of poems, Hindu and Greek, began through oral tradition: story after story piled on one another through endless cycles of vocal repetition, perhaps accompanied by music, before taking written form. This is why I refer to these famous sagas as primordial.

Other parallels should not be discounted. Both Hindus and Greeks believed in the transmigration of souls, rebirth in future lifetimes. Both traditions made much of intoxication as
a means of being possessed by divine forces in mystical union with the godhead. For the Hindus soma, the drink offered to the deities along with fire as complementary opposites. For the Greeks, wine: inducer of the frenzied rites of the Bacchus (Dionysus) cult. The Bacchiads - the devotees of wine intoxicated Bacchus – were a cult of mystical ascetics whose extreme rituals could and did turn violent most notably in the famous accounts of the band of female Maenads tearing apart wild animals in their violent ecstasies. Again in the early Ionian school of Greek philosophical though cultivated at Miletus on the coast of Asia Minor the idea of universal wind or breath central to the Upanishads is paralleled by the views of Anaximenes who argued that air surrounds and cements together the universe just as the soul holds together the body. That said, Greek Axial Age thought and Indian Axial Age thought are profoundly different. To simplify to the point of caricature Indian Axial Age thought evolved together with the social order into a caste based system relying heavily on the moral ethic of karma. One can think about this as horizontal system in the sense that caste came to pervade all or most Indian kingdoms and princedoms, cutting across jurisdictional lines. By contrast Greek thought developed most saliently along vertical fault lines, fiercely independent city states differentiating themselves on religious, philosophical and constitutional grounds. Out of the warring between polis factions within city states, and out of the warring and jockeying for hegemony between city states, emerged a powerful dynamic etched in both ideas and material reality: the pendulum swing.

To illustrate the various pendulum swing I will take it up in three dimensions: in politics and military affairs focusing on the contrast between Athens and Sparta; in the nature of
Athenian drama during the period of Athenian ascendency and imperial control over a vast Aegean Sea empire (the fifth century BCE from the Battle of Marathon to the late 400s BCE); and the oscillation between mystical philosophy and scientific philosophy, mainly drawing from the atomists, from Plato, the mystical and Aristotle, the scientific.

In many dimensions Sparta and Athens were diametric opposites. Sparta was a highly militarized society adept at fighting on the land; innovative in deploying troops (using the peltasts who were more lightly armed than the hoplites outfitted in expensive armor); a stable oligarchy; and a crafty organizer of war-making coalitions, notably the Peloponnesian War alliance that brought imperial Athens to its knees. By contrast Athenian constitutions oscillated between the despotic tyranny of Draco and the democracy of the fifth century. Athens exploited its closeness to the Aegean to fashion a far flung empire surrounding that sea, bringing under its mantle Rhodes, Samos, Miletus, Euboea, Thasos and the shores of the Proconnesos all away north to Byzantium. In doing so it promoted its version of democracy, made significant innovations in shipbuilding, and promulgated worship of Athena, its patron deity.

The stability of Spartan government – a luster that appealed to Plato who imagined a stable utopia in his mid-career masterpiece, *The Republic* – was remarkable, unique among Greek city states (although Crete shared its military orientation). Devoted to war, citizens in the *polis* – exclusive of helots who were a quasi-slave underclass whose Laconia ancestors had been defeated by the Spartans – were taken from their families, drilled in military techniques between the ages of five and thirty, ordered to eat in common dining establishments with their
fellow trainees. Discipline above all was the keystone of social stability. Sparta had two kings who ruled together as religious and law enforcing power over an oligarchy consisting of military commanders and an aristocratic council, the Gerousia. One of the two kings would take part in military campaigns, leaving the other behind to tend to domestic business, including dealing with the possibility of helot rebellion.

Unlike the stability enjoyed by the Spartan polis, Athenian political life was chaotic. During the late seventh century BCE attempts to enforce tyranny gave way to the dictatorship of Draco who imposed a harsh law code in the aftermath (hence the world draconian). Feuding amongst the oligarchs ushered in rule by Salon – statesman and writer of poetry – who encouraged the spread of democracy. Having been drawn into a Greek city state alliance of convenience aimed at repelling a Persian drive for hegemony in the Aegean, Athenian forces proved valiant at the Battle of Marathon in 490 BCE. For the next eight and a half decades Athens went about consolidating its control over the Aegean, exploiting its mighty navy in a bid to predate over its commercially oriented colonies in Asia Minor and northern Greece. Predation and trade marched together as did the spread of democratic constitutions. What were the main features of Athenian democracy? One was the popular assembly, the ekklesia. Another was the jury system wherein popular jury members who were chosen and most important paid for their services. It is important to keep in mind that Athenian democracy excluded women – who were probably required to be veiled – and slaves who did much of the grunt work. While it is not proper to refer to the typical Greek polis as a caste society it can
usefully described as enjoying a quasi-caste complexion enforced by legal code backed up by military prowess.

Testimony to the extreme jealously of powerful Greek rivals – especially fear of hegemonic rule by anyone mighty city state – harbored by the city states is their willingness to enter into alliances of convenience aimed at defeating powerful rivals. Remarkably, some city states dared to approach their arch enemy, the Persians, in a bid to defeat a Greek rival. Paralleling this is the extreme localness of Greek polytheism. Consider worship of the god Apollo. A priest operating in a temple in one of the city states – say Corinth – would not be qualified to perform rituals in an Apollonian temple in one of the other city states, say Athens or Thebes. The ruler of Corinth ordered its military to drive out the Bacchiads: abject fear of a faith erupting out of the bowels of a competing Greek city state in the Greek world was hard cold geopolitical reality. To return to a point made earlier: one gathers than the institutionalization of Hinduism was extremely different. Caste crossed jurisdictional lines, a Brahmin being a Brahmin enjoying special ritual privileges throughout the land.

To summarize Greek city state politics exhibits strong pendulum swings both within and between states. Tyranny gives way to democracy; kings gave way to dictatorships; democracies become absorbed by oligarchies. City states, hyper-jealous of the pretenses of their rival city states, form alliances aimed at whittling hegemonic pretenders down to size. Minnows are afraid of co-existing with sharks.

Athenian drama in the great fifth century characterized by empire building and democracy illustrates the pendulum swing principle in another dimension. In the thirty two
plays that have come down to us we can see the pendulum swing at work. It swung within dramas; and the pendulum swung between three different types of drama, namely between tragedies and comic pieces, satyr plays or comedies.

Consider the tragedies Aeschylus, Sophocles and Euripides. Aristotle, writing at the dawn of the Hellenistic period, argued that Greek tragedy emerged out of a dithyramb sung by choruses devoted by Bacchus (Dionysus). In short its origins are religious, not surprisingly drawing heavily from the polytheistic Homeric legends, particularly the tragedy of the House of Atreus. The heroes may have been ancient but the message was contemporary, exceedingly political: at its heart lay the pendulum swing bringing the arrogant hero to his knees, the heroine to her just deserts. There is no better example that the Orestria trilogy of Aeschylus. In the Agamemnon the common folk bristle at the highhanded behavior of Queen Clytemnestra who, in league with her lover Aegisthus, has wrested power from her husband who they have killed. The chorus, representing the people, attacks the queen, the demagogue. For an Athenian audience celebrating its democratic rights all of this carried a powerful political message: beware of our power we wield you aristocrats; shield your swords; do not dare upset our constitutional applecart! We will check you! Do you think you dare to ignore our religion, our oracles: behold Oedipus, devoid of sight! In Euripides’ Bacchae a king excessively absorbed in micro-managing the populace through his despotic laws refuses to carry out his religious obligations thereby sending his city state into a tailspin. At the denouement he is torn to shreds, blood sacrifice brought on by his failure to respect the checks democracy imposes on a righteous ruler.
The comedies mocked the tragedies. For instance in Aristophanes’ comic *Frogs* Dionysus is ordered by Pluto – grim god of the underworld, seated around a table with his minions - to judge a contest pitting two of the great Athenian tragedians Aeschylus and Euripides against one another. Who shall occupy the “Best Tragic Poet” seat? Pick from the Greek dramatists currently residing in Pluto’s underworld please. Aeschylus triumphs because his verbiage is “heavier;” Euripides is too slick. Again in the *Clouds* Aristophanes’ takes aim at Socrates, gently making fun of the great philosopher.

Greek drama swung between two antipodes. Tragedy always invested with a serious ominous political and religious message could and was counteracted by comedy. The Athenian audience had its cake and ate it too. Skepticism was rife: you always knew the pendulum might swing.

As well Greek philosophy swung between two poles: religious mysticism and proto-science.¹⁴

We associate the proto-scientific school with the earliest of the known Greek philosophers: the group of thinkers gathered in Ionian Miletus. Evolutionary and materialist, not deistic, thinking was the hallmark of the views of Thales, Anaximander and Anaximenes. For Thales water underlay everything; for Anaximander the universe consisting of many worlds emerged out of boundlessness and was destined to be reabsorbed into it. For Anaximenes air was the ultimate substance, binding all matter together in a unity, just as the soul (consisting of air) contains and holds the physical body together. Air is the ultimate cement. While we should not think of this reasoning as overtly atheist skepticism about the existence of a transcendental
world does pervade it. Or rather skepticism about any particular theistic vision: the philosopher Xenophanes altogether rejected anthropomorphic representations of deities. He pointed out that Thracians imagined their gods as Thracians while Negros thought the divine bodies were Negroid. Early Greek materialist reasoning was crowned in the fifth century BCE with the speculations of Democritus who conceived of physical reality in terms of atoms, unobservable but still real minute particles.

At the other pole of Greek philosophy was mysticism. Russell (1945: 16-17) traces the mystic tradition back to Bacchus, specifically to the religious cult exalting Orpheus, the Orphics. The ascetic Orphics longed for purification. Outside of eating animal food in sacramental rituals they abstained from consuming meat. Active in the late sixth century BCE Pythagoras inherited this tradition. He founded a religion that mixed the purity of mathematical logic to asceticism aimed at guaranteeing the purity of the soul that he reckoned would be reborn in future bodies (transmigration of the soul). Mathematical knowledge came through ecstatic revelation; divinity was embodied in it. It is hard to separate this cult of esoteric knowledge from Gnosticism, the view that privileged elites – and only privileged elites – are granted access to truth, a theory captured in the notion vividly realized in Plato’s Republic, the typical human consigned to observing shadows cast against the wall of a cave by a fire lit behind their backs, only elite philosophers escaping the dark dungeon, basking in sunlit ultimate reality.

The ancient philosophers sought stability. Their agenda was resting reasoning on a unified firmly rooted foundation, freed from the transient, stripping away speculations reflecting the earthquake-like shaking that humdrum quotidian reality throws up into our faces.
In the Greek case this meant avoiding the pendulum swing. The two most famous philosophers of the Hellenic world, Plato and Aristotle, illustrate this phenomenon. Interestingly enough, their solutions to constructing unshakeable foundations show that this goal can be realized in a totally religious-mystical philosophy (Plato) or along proto-scientific lines (Aristotle). Ironically in proposing radically different interpretations of stability they set in motion a pendulum swing in philosophical thought that echoes through Western thought even to this very day.

Pursuing the vision of Pythagoras, Plato flourished in the late fifth and early fourth centuries BCE. Athenian democracy was under attack by threats of tyranny in his lifetime. At the center of Plato’s early writings – Apology, Crito, Eurthyphro, Phaedo, Ion – is the figure of Socrates, the gadfly of Athens. Socrates had a peculiar attitude toward the democracy Athenians had managed to eke out in the fifth century. On the one hand he reveled in the freedom of speech it promoted. The Socratic dialogues are dialectical. They are grounded in the back and forth of logical argument. Individual Intellectual freedom was all, leading Socrates to question the validity of the Athenian gods themselves. Indeed Socrates claimed to have a personal god, his daimonion.

At the same time Socrates had contempt for the common person. At heart he was an elitist, a mystic, a proto-Gnostic. Plato captured the contradictory nature of Socrates in the Apology, an account of Socrates defense against the accusation that he “failed to acknowledge the gods that the city acknowledges” rather “introducing new deities.” When pronounced guilty of impiety Socrates was offered two options: exile or death. Exile was certainly a viable option. Socrates could have removed himself to Thebes where likeminded Pythagoreans thrived, taking
in exiles pushed out of a myriad of city-states. Yet Socrates chose death. Why? Because committed mystic as he was, death held out no terror to him. This is the religious vision centered on self sacrifice of the holy martyr, the religious hero. Not surprisingly the Socratic choice exercised a peculiar fascination upon martyr stained early Christianity. Christian philosophers - notably Saint Augustine, later Boethius penning *The Consolation of Philosophy* in his prison cell where he awaited execution – were attracted to Platonism partly due to the edifying example of Socrates, his glorious soul soaring triumphantly over the mundane reality of death.

Just as Socrates was inconsistent in his attitude to democracy, so was Plato in his reaction to the accusation of impiety leveled at Socrates. Plato’s search for political stability led him to idolize Sparta the most stable of the Greek city states, developing his theory of the *Republic* along Spartan constitutional lines. In his account of the ideal utopian city, the polity is divided into three groups. Situated at the top of the city-state hierarchy is the class of philosopher guardians imbibing mystical truth, able to grasp the forms or concepts constituting ideal reality. Occupying the middle stratum is the group of soldiers providing protection for the people. At the bottom are the rank and file commoners, those completely blind to the light. To ensure stability the commoners must be controlled, fed state propaganda fashioned by the elite guardians.

Note the paradox: this is tantamount to banishing any freethinker like Socrates who questioned the mystically pure elite. Reasoning along these lines, Plato argued that the Guardians should practice communism, rejecting private property, sharing wives in common.
Shades of Spartan communal military training? Or was it radical invocation of purified monastic rule? Plato’s willingness to suppress free thought in the service of stability reached an apex in his late writings, notably in *Laws* where he advocates establishment of orthodox state faith.

At the other end of the Greek philosophical spectrum was Aristotle. Despite having been a student of Plato at the Platonic Academy, Aristotle ultimately rejected Platonic idealism, the notion of immaterial forms. Ionian at heart, a keen observer of the natural order, Aristotle was a particularly avid biologist. For Aristotle matter and form were intertwined. He even speculated about the birth of the soul: was it in the male sperm alone? How important was the female contribution?

Aristotle’s fear of pendulum swing instability encouraged him to develop a theory of government in which the middle class, not the Platonic elite, was the key ingredient to a lasting constitution. To be sure slaves were inferior. Primarily moved by emotional instincts, slaves were more akin to animals than rational humans and should be guided by their rulers. Key to government is proper balance between acceptable levels for the concentration of wealth and absolute equality. Rejecting communism – only private property induces innovation, thereby improvements in the technological arts – Aristotle argued that the greed and arrogance of aristocrats should and could by tempered by ideology encouraging humility and public mindedness among the economically successful:

“The common people quarrel about the inequality of property, the higher class about the equality of honor .... the beginning of reform is not so much to equalize property as to train the nobler sort of natures not to desire more .... governments which have a regard to the common interest are constituted with strict principles of justice, and are
therefore true forms; but those which regard only the interest of rulers are all defective...”

Aristotle’s pragmatic agenda - taking into account the realities of human nature, including appreciation that resentment, hostility, and greed cannot be denied or argued away in idealist mysticism – was aimed at preventing the debasement of potentially good forms of governance. Relatively pure societies should not be allowed to generate into muck. He viewed tyranny as a perversion of royalty; oligarchy a perversion of oligarchy; and democracy a perversion of constitutional government. In short he advocated a “middle way” balance between inequality and equality that would stabilize governance in good forms, ones that promoted real world justice.

Aristotle’s relentless search for a middle ground is hardly restricted to politics. It pervades his physics as well. There is a unity in nature. Everything on the physical world is animated; everything – goats, pigs, birds, rocks, water, air - is animated, potentially subject to being moved. Motion is not desirable. It should be resisted just adjust political states should be prevented from degenerating into impure types. Within the universe is a motionless realm: an outer ring, totally pure, where the fixed stars resided. The four elements – air, water, fire and earth – seek their proper places in a circular hierarchy of rings located between the world humans inhabit and the outer shell where the stars twinkle in their unmoving glory. On earth air is somewhat sullied; only when it reaches its proper location does it exist in a purified form. The same applies to water; the same applies to fire. At the center is the natural realm of earth; above it the realm of water; above that the realm where air seeks to find its motionless state; and above that the natural locus for fire that spews out the comets observed flashing through
the heavens. The four elements are mixed together at the center of the cosmos, but they
naturally move toward the realms where they enjoy constancy, no longer subjected to rough
and ready mixing, no longer forced to move.

What explains the impulse of objects and animated life crossing through the mediums of
air and water? The answer: animation within the medium. Shoot an arrow through air. The air
moves it as it is loosed from the bow; finally – if it does not find a target but keeps on flying – it
stops from moving because the animated air puts on the brakes. From this hypothesis Aristotle
deduced an incredibly important corollary: a vacuum cannot exist. The reason is simple. If there
is no air there is nothing to move the arrow, nothing to stop it from moving. This is a
contradiction: an arrow cannot occupy two distinct places at the same time.

Let us summarize. The Greek Axial Age was characterized by pendulum swings: in
political life; in drama; and in philosophy. Set in motion by the xenophobic clashing city-states
the principle of the pendulum swing continued to work its way through the Hellenistic era that
saw Greek culture spreading from Egypt through Afghanistan to western fringes of India, and
through the dominance by Rome of a sprawling empire stretching from Western Europe - Spain,
through Gaul, even across the channel to England – through the Mediterranean into Asia Minor
and across the expanse of Northern Africa.

The strength of the pendulum swing lies in progress, in intensification of thought and
action in competing arenas each working hard to outdo the other. It is impossible to imagine
Aristotle without appreciating his tutelage in Plato’s Academy. It is impossible to understand
Aristophanes without taking into account the artistic nature and practical real world politics
surrounding Athenian tragedy. Ferreting out the weaknesses in your adversary’s position encourages critical thinking and critical analysis that can be turned against your own position, encouraging you to shore up your stance. Like it or not, we strive harder when we are trying to overcome our adversaries. Competition is not a bad thing. Cooperation at the cost of retarding progress is not necessarily a good thing. As well, its appeal is rooted in heterogeneity. By dint of temperament, native intelligence, nurture, good or bad luck, we are a highly diverse species. Let loose in an environment where we can choose sides, we have options. We form strategic alliances, sequestering our positions under the canopy of a “big tent.” Absent a protective umbrella we have no chance of seeing our pet ideas, our material agendas, become reality. Our colleagues in the “big tent” presumably feel likewise. Consider the alternative: censorship preventing individuals the right to choose. Cast loose in an environment where options are severely constrained, talent and enthusiasm falls by the wayside.

*Predation, Gift Exchange, and Markets in the Roman Empire*

Empire building in the ancient world was built on military predation. This was true of Alexander the Great’s remarkable – but transient – Hellenistic empire stretching from Macedon through Asia Minor, Persia, and into the fringes of India. More important it was the cornerstone of the far more stable Roman Empire that arose in the wake of the disintegration of Alexander’s territorial acquisitions.

Predation is costly. First and foremost it requires very high levels of cooperation. In battles soldiers often perish or are severely maimed during their armed engagements. The most successful military campaigns are built on the backs of recruits systematically drilled into
working together in as seamless a fashion as possible. To encourage armed personnel to fight ferociously and fearlessly they must be well fed, adequately housed, provided with avenues for deployment. As well they must be given strong incentives. Predation is win/lose: defeat your enemy you acquire land, indemmites, captured arms and currencies. Acquiring the spoils of war certainly provides incentives for rank and file warriors. On the other hand the costs of mounting campaigns are born in advance of conflict; moreover you incur these costs even when your side is defeated.

In short the costs and benefits of predation are unpredictable in the long run. One reason why they are unpredictable is predation turning against itself, living by the sword/dying by the sword so to speak. Under one scenario, generals controlling armies may well turn against each other, warring with one another setting off internecine conflicts that may - and often did in fact - lead to the dismemberment of the empire as a whole. This was the fate of Alexander the Great’s sprawling empire. It is reported “godlike” Alexander gave up the ghost in 323 BCE – perhaps poisoned by erstwhile supporters – and within two years four decades of warfare ensued. Finally the remnants of empire coalesced into four power blocks: Ptolemaic Egypt; Seleucid Mesopotamia and Central Asia; Attalid Anatolia; and Antigonid Macedon. At times enmity between rival blocks generated into open conflict. A second scenario envisions successful predation leading to a concentration of wealth and power within a small sub-jurisdiction of an empire, its core as opposed to its periphery. In this case outside predictors may be attracted by the glitter of the gold. A third scenario sees the troops doing away with the general, electing a new leader from their ranks, setting off a chain of internal predatory
conflicts within the military itself. It is noteworthy that Alexander’s string of conquests in the east was brought to a close by his own troops rebelling against his plans for further fighting.

Through astute political management Roman politicians and Roman armies and navies managed to sustain successful predation across four centuries, adding freshly conquered territories onto the frame of the empire between 241 BCE until 199 CE. Use of the political swing – moving from Republican governance to several different forms of rule by one figure - sometimes several sharing power either as equals or as junior and senior – Emperors helped to stave off centripetal tendencies. However despite the exercise of considerable creativity devoted to crafting solutions hemming in predation struggles, the Romans ultimately were stumped, their political vigor sapped by predation turning against itself.

A second problem posed by dependence on predation as a strategy for generating income and wealth is the demand it imposes on economic resources. It competes against other uses of the social surplus generated above and beyond the subsistence needs of the population of a political jurisdiction. In the ancient world most producers were subsistence producers: they raised animals and harvested crops they directly consumed and utilized as energy sources within the confines of their households. The surplus left over was either taxed away or predated away by governments and military organizations to sustain further predation and bureaucratic governance over colonial possessions; or it was turned over voluntarily or involuntarily to religious organizations that engaged in gift exchange with the transcendental world; or it was spent on win/win market commercial transactions.
Competition between the three ways to allocate the social surplus springing forth from the economy of the Roman Empire animated political and ideological pendulum swings. One arena in which the pendulum swung with a vengeance was within the field of gift exchange itself. Had religion and its relationship to the state not been such a contentious issue – first in the Hellenistic world, later on within the Roman Empire – disruption arising from the pendulum swing might have been contained within reasonable bounds. A useful comparison is between the Chinese and Roman Empires. The capacity of the Chinese Emperor and his or her bureaucracy to exploit religion - treating it as a mask concealing the brutal exercise of harsh legal and military power – is exemplary. Despite the attempts of Roman Emperors to harness religion in a likewise manner, it was only later - after the empire had fallen into complete decay - that attempts were made to harness Nicene Christianity as an effective masking device.

A third challenge - ultimately weakening compromises hammered out between the three contending parties struggling against each other for slices off the social surplus pie – stemmed from shrinkage in the surplus itself. To some extent this was exogenous, stemming from climate change; to some extent it was endogenous, a byproduct of predation turning against itself.

Despite its eventual collapse in the fifth century CE, the success of Rome in its organizing predation prior to its collapse is truly remarkable. Beginning with conquest over the Latin and Greek communities lying to its south and beating back assaults by Gauls to the north, Roman armies – conscript at first, later professional – destroyed powerful Carthage in the Punic Wars of the 200s BCE. In doing so it amassed an effective naval force with which it made a bid, -
eventually successful after Mark Anthony swept marauders away, ridding the Mediterranean of pirates and potential military foes alike – of dominating all of Mediterranean waters. Advancing westward into Iberia, Roman forces took Spain (206-25 BCE), connecting the imperial center to the shores of the Atlantic. Attacked by, and attacking disparate groups of Gauls, Caesar Augustus led troops into the north, triumphantly bringing restive tribes to heel (121-49 BCE). By 90 CE Rome had incorporated the lands subsequently known as France, Belgium, and Germany into its European holdings. Meanwhile separate armies made forays into the east, conquering Hellenistic Greece through eight decades of fierce combat (148 – 67 BCE), taking Egypt by 30 BCE, and ultimately absorbing all of Turkey. Serbia, Romania, Syria, Jordan, and Western Arabia all fell to Roman arms shortly thereafter. At its eastern reaches it occupied a bitterly contested frontier, Persian forces prepared to attack if provoked by Roman aggression.

In short, by 200 CE Rome had consolidated a far flung empire centered at Rome. Its navy guarded seas: Mediterranean, Adriatic, and Aegean. Its armies were stationed throughout all of North Africa, most of Western Europe, slices of British territory, and huge swaths of Asia Minor. Establishing a defensive line stretching from Switzerland to the Black Sea, Roman rulers stationed armies and erected outposts – even constructing a wall in some areas – along this great defense line that guarded a truly grand land area (estimated at around 5,000 square kilometers in 117 CE). Why? To put it simply: predation breeds predation. Like the Chinese empire builders at the other end of the Eurasian land mass, Roman political leaders were not sleepwalkers. They never relaxed their vigilance, consequently fretting over the doings of nomadic Eurasian groups residing along the fringes of their perimeter.
Who where these Eurasian nomads? What was the logic of their mobility? However imperfect throwing out an analogy to a pool table may assist us in comprehending the land mass stretching from Roman Empire in the west to Chinese empire it the east.

Play pool on this table. As one ball commences rolling it bounces against formations of balls, causing them to spin, fly apart, crashing their way across the table till they reach pockets where they are either absorbed (incorporated into a agrarian civilization) or settle along walls, etching out a niche near the frontier of an agrarian civilization. Something like this is how the cultural map of the Eurasian center evolved during the period leading up to, and continuing through, the initial institutionalization of the Axial Age traditions. Tribes continually clashed, making treaties afterwards, crafting coalitions typically short-lived, the most heroic and bloodthirsty groups eventually pummeling and pushing their weaker adversaries towards the steppe boundaries.

Start at the center of the table. This is where the most dramatic break-out occurred. From somewhere in Central Asia – in all likelihood in the region just north of the Black and Caspian Seas – a group speaking a proto-Indo-European language broke out, spreading outward to all points on the compass. Celts, Italics, Illyrians and Greeks moved into the Mediterranean basin; Thracians, Hittites, Luvians, Lycians into the eastward reaches of the Aegean and Anatolia; Slaves and Germanics northward towards what became Scandinavia; and Aryans, Iranians and Indics to the east. Exactly when, and from what homeland dispersion, originated is much disputed. As McEvedy (2002: 100) acidly concludes speculation regarding timing and original settlement of the Indo-European tribes is “a game without rules.”
The gradual dispersion and settlement into ecological niches of the Indo-Europeans pushed them up against a various groups: a West Mediterranean group inhabiting Iberia; a Uralic group in the north; a Elamo-Dravidian group occupying the Indian sub-continent; and a Afro-Asiatic group splitting into Berbers, Egyptians and Semites in Africa north of the Sahara and the Levant. Through a combination of accommodation and conquest sub-groups of the Indo-European peoples settled into the lands passing through the Neolithic revolution. They abandoned the nomadic life. The lucky conquerors became priests or warrior-rulers in their new homelands. The less favored farmers, servants, merchants. Once settled, either they became fierce adversaries of, or trading partners for, their former nomadic brethren.

As populations grew in the great agrarian centers, and as rulers mastered warfare using Iron Age weapons and tactics, empires were carved out on the periphery of Central Asia: China and India on its east; along its heavily contested southern/central zone a sequence of empires (at various times dominated by Hittites, Babylonians, Assyrians, and Egyptians); and in the west Greek then Roman. As the nomadic tribes of Central Asia jostled about some gradually pushed up against these empires.

For example consider the west. Over time a number of the nomadic groups, further subdivided, established niches on the border of the Roman Empire, basically just northeast of the Rhine. For instance having been pushed southward by Alans and later Huns, Germanic tribes settled into a zone between Slavic territory and the reaches of Roman control. Circa 300 CE, Saxons, Visigoths, Ostrogoths, Asding Vandals and Siling Vandals staked out territorial
claims on the edge of the Empire while Franks and Alemanni managed to gain entry to the Empire itself.

In the east a similar frontier situation prevailed. At its northwestern borders, Chinese Emperors struggled with the Xiongnu who commanded 300,000 cavalrymen, a formidable threat.\textsuperscript{18} By crafting an alliance with another nomadic group, the Yuezhi, Chinese generals dreamed that their combined militaries could quickly bringing the pesky Xiongnu to their knees. Failing in their effort the Chinese generals abandoned the Yuezhi to a horrid fate. The Xiongnu promptly defeated the Yuezhi, killing the Yuezhi chief, crafting his skull into a drinking vessel (a standard way to celebrate victory on the Central Asian steppe). Driven westward and southward the Yuezhi eventually settled in several regions, notably Bactria (today a region shared by Afghanistan and Uzbekistan). Eventually the once hapless Yuezhi were able to form the Kushan Empire that managed to make inroads into northern India.

In short the borderlands fringing the great classical age empires emerging out of the Iron Age were potentially unstable. Military pressure from the interior of Central Asia was one problem. Population growth or climatic disruption preventing re-growth of grasslands within its vast interior would certainly set the billiard balls in motion.

As well pressure from the great empires pushing outward into its reaches was a destabilizing element. For example the greatest economic triumph of the classical age – the establishment of the land-based Silk Road around 14 CE – was largely due to Chinese military victories upon the Tarim Basin rendering relatively safe passage over 2000 miles of the 4,400 miles stretching from Changan, China’s western capital from Antioch on the Mediterranean.\textsuperscript{19}
To be sure the economic interests of emperors and kings and the interests of the nomadic tribes operating along the Silk Road coincided: rulers secured taxes; the heroic leader of a nomadic tribe received luxury goods he lavished upon his comitatus. At the same time as tribes were absorbed into the empires or chased away, even exterminated, in humiliating defeat, they had to adjust to new realities. Many so-called barbarian groups ended up as soldiers employed by the empires that had crushed their former leaders.

That the wealth accumulated in Italy, especially in its metropolitan center Rome, was a shining prize worth considerable risk in capturing, is evident from Table 1. Inhabitants of the imperial center, particularly the elites (senators, knights), lived in luxury unknown to the most successful of the nomadic Eurasian tribes.
Table 1
Population, Population Density, Per Capita Income Estimates for the Roman Empire; Free and Slave Populations; and Elite Incomes, Circa 14 CE

A: Population (P), Population Density, Persons per Square Kilometer (d), and per Capita income (y) in 1990 Geary-Khamis Dollars, Circa 14 CE: Maddison’s Estimates

<table>
<thead>
<tr>
<th>Sub-region</th>
<th>Population</th>
<th>D</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P (1,000s)</td>
<td>% of Empire</td>
<td></td>
</tr>
<tr>
<td>Roman Europe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peninsular Italy</td>
<td>7,000</td>
<td>15.9%</td>
<td>28.0</td>
</tr>
<tr>
<td>Iberia</td>
<td>4,150</td>
<td>9.4</td>
<td>7.0</td>
</tr>
<tr>
<td>Gaul</td>
<td>5,800</td>
<td>13.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Total</td>
<td>23,100</td>
<td>52.5</td>
<td>10.4</td>
</tr>
<tr>
<td>Roman Asia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater Syria</td>
<td>4,000</td>
<td>9.1</td>
<td>36.7</td>
</tr>
<tr>
<td>Total</td>
<td>12,200</td>
<td>27.7</td>
<td>18.3</td>
</tr>
<tr>
<td>Roman Africa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>4,500</td>
<td>10.2</td>
<td>160.7</td>
</tr>
<tr>
<td>Total</td>
<td>8,700</td>
<td>19.8</td>
<td>19.6</td>
</tr>
<tr>
<td>Entire Empire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empire</td>
<td>44,000</td>
<td>100</td>
<td>13.2</td>
</tr>
</tbody>
</table>

Table 1 [Continued]
Panel B: Free (F), Slave (S), and Total Populations; Employment and Activity Rates (AR), and Income per Person (y, in HS, sestercii), Circa 14 CE: Maddison’s Estimates
<table>
<thead>
<tr>
<th>Population Type</th>
<th>Population (1,000s)</th>
<th>Employment</th>
<th>Income per person (HS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Activity Rate (AR)</td>
<td>Total</td>
</tr>
<tr>
<td>Peninsular Italy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free (F)</td>
<td>4500</td>
<td>.36</td>
<td>1620</td>
</tr>
<tr>
<td>Slave (S)</td>
<td>2500</td>
<td>.80</td>
<td>2000</td>
</tr>
<tr>
<td>Total</td>
<td>7000</td>
<td>.52</td>
<td>3620</td>
</tr>
<tr>
<td>Rest of Empire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free (F)</td>
<td>35,000</td>
<td>.36</td>
<td>12,600</td>
</tr>
<tr>
<td>Slave (S)</td>
<td>2,000</td>
<td>.80</td>
<td>1,600</td>
</tr>
<tr>
<td>Total</td>
<td>37,000</td>
<td>.38</td>
<td>14,200</td>
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<tr>
<td>Total Empire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free (F)</td>
<td>39,500</td>
<td>.36</td>
<td>14,220</td>
</tr>
<tr>
<td>Slave (S)</td>
<td>4,500</td>
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<tr>
<td>Total</td>
<td>44,000</td>
<td>.405</td>
<td>17,820</td>
</tr>
</tbody>
</table>

Panel C: Elite Incomes (million sesterii HS), Total Number of Elites by Type, and Per Person Income, Circa 14 CE

<table>
<thead>
<tr>
<th>Type</th>
<th>Total Empire</th>
<th>Peninsular Italy</th>
<th>Rest of Empire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Income</td>
<td>Number</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Per Person</td>
<td>Total</td>
</tr>
<tr>
<td>Emperor</td>
<td>1</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Senators</td>
<td>600</td>
<td>.15</td>
<td>600</td>
</tr>
<tr>
<td>Knights</td>
<td>40,000</td>
<td>.03</td>
<td>24,000</td>
</tr>
<tr>
<td>Decurions</td>
<td>240,000</td>
<td>.008</td>
<td>80,000</td>
</tr>
<tr>
<td>Other</td>
<td>50,000</td>
<td>.02</td>
<td>17,000</td>
</tr>
<tr>
<td>Total Elite</td>
<td>333,601</td>
<td>n.e.</td>
<td>121,601</td>
</tr>
</tbody>
</table>
Table 1 [Continued]

**Source:** Maddison (2007: pg. 35, 40, and 50).

**Notes:**

- n.e. = not estimated

Maddison assumes that elite income is the sum of rents on estates and property in the provinces, emoluments, perquisites, and spoils of office.

Knights are *equites*

*Decuriones* are municipal councilors.

How did the economy of the Roman Empire function, prospering to the degree it did as the table eloquently demonstrates?

To be sure, predation was a major factor. Its impact was both direct and indirect. It brought in war indemnities, precious metals, and other spoils of combat. Slaves were captured. Unlike free individuals, slaves had little choice over the amount of leisure they carved out. The estimates in Table 1 suggest slaves toiled much harder than their free compatriots. Land onto which colonists migrated relieved Malthusian pressures. 21 Low population densities existing in most of the imperial periphery proved a magnet for Roman citizens. Setting up farming in sparsely populated zones was a good deal. It allowed farmers mainly focused on growing grain to set aside fields for the succor of chickens, goats, sheep, pigs, horses and cows. Surely this is one reason soldiers were willing to exert themselves in warfare.
A favorable climate certainly helped. There is considerable evidence that the early empire enjoyed a “Roman spring.” By raising crop yields it increased the surplus that could be extracted out of the economy, enhancing the capacity to carry on predation.

Most important consolidating a huge empire patrolled by navy and armies and crisscrossed by major roads reduced the costs of carrying on trade: less piracy; a common legal and monetary system backing up the commerce; well defined avenues for delivering goods from one locale to another. Apply the logic of comparative advantage: land, labor and capital can be used more efficiently if they specialize. Grow wine in Gaul; grow olives in Greece; secure minerals from mines in Spain; extract wheat from Egypt, the great breadbasket of the Roman Empire, major source of the wheat shipped to Rome at the behest of the government committed to dispersing free – or very cheap – foodstuffs to the masses concentrated in the metropolitan core, the so-called annona.

Employing an augmented production function elaborated in the Appendix to this paper I provide a comprehensive framework for decomposing non-predation production. Labor input is decomposed into the number of workers, hours worked per worker, and the efficiency with which workers labor; capital is decomposed into a quality component and a quantity component; and land is decomposed into a quality component and a quantity component. Based on my reading of the recent literature on the Roman economy I suggest the following conclusions: (1) labor input viewed in terms of efficiency was not particularly high because education was not widely diffused throughout the economy; (2) slaves worked long hours but free workers did not; (3) land quality was fairly high, enhanced by comparative advantage; (4)
capital stock was not of particularly high quality (windmills and waterworks were certainly important but most of the capital stock was concentrated in housing and structures utilized for religious purposes).23

What about total factor productivity? As I argue in the Appendix it reflects three things: the distribution of employment; the level of disembodied technological knowledge; and scale economies in production and distribution. As for the distribution of the labor force the evidence suggests it was primarily employed in farming and predation. As for scale economies, the evidence on manufacturing indicates most of the firms were of very small scale.24 Finally consider the state of knowledge exploited by Roman science and its technological applications is simple: I believe it was low. One reason I assert this is the state of knowledge. Aristotle, whose physics bristled with animism, was viewed as completely credible among the ancients. Indeed even in the writings of medieval scholastics relying upon Muslim scholars who in turn were inspired by the learning of the ancients, the acceptance of Aristotelian animism was virtually unquestioned. To be sure Galen made major contributions to medicine and Ptolemy to astronomy readily incorporated into an Aristotelian framework by Muslim, later medieval Christian, thinkers. But all of this was swept away as if it were mere child’s play by the natural philosophy of the sixteenth and seventeenth centuries. The ancients simply lacked the precision instruments that loomed large in the experimental work of natural philosophers. You cannot push technological sophistication very far in such a world.

The view that the performance of the Roman economy somehow added up to capitalism is a view I completely reject.25 To be sure, the definition of what constitutes
capitalism is an issue in reaching this conclusion. If by capitalism you mean markets in which merchants operated, yes the Roman economy was capitalist. Whenever you have comparative advantage bolstered by specialization and division of labor you have markets. When the scale of the economy reaches a sufficient size you find merchants acting as mediators between buyers and sellers. If what you mean by capitalism is a system in which powerful elites own the means of production and most of the capital and workers provide labor services, you have to wonder. A lot of the land was farmed on a small scale; a lot of the capital was tied up either in miniscule structures – houses crafted from stone, mud and clay – or in religious structures. If what you mean by capitalism is a dynamic economy in which capital is churned around, moving from sector to sector, moving from domestic to foreign uses, then the Roman economy was not capitalist.

More than anything else the Roman economy was predatory. It was not capitalist.

Predation is a risky foundation for an economy. As emphasized already predation breeds predation, bringing the engine of growth of such an economy to a grinding halt. Indeed this is eventually what happened to the Roman economy.

That the Romans struggled to keep predation from devouring itself alive is clear from the various experiments undertaken by successive Roman governments. Originally a kingdom, Rome became a republic administered by a powerful group of senators. As armies commanded by powerful generals marched westward, southward, eastward and northward (some staying in the metropolitan center to quell slave revolts, notably the Spartacus revolt) competition between the powerful military leaders selected amongst the ranks of the senators precipitated
on-going factional fighting, ultimately dooming the republican form of government. Two Triumvirates—power sharing agreements to divide the empire into regions each under the dictatorial control of a feared general—were cobbled together. Eventually they collapsed after Caesar was assassinated when he defiantly marched his army back from Gaul into the environs of Rome. His adopted son Octavian was able to establish a centralized system under the nominal control of a single dictator himself as Augustus. Still, wary of the senate, he cautiously took the title “Princeps Civitatis” (First Citizen of the State) rather than “Dominus et Deus” a term that gradually came into common usage later on, formally adopted by Diocletian ruling as emperor from 284 CE to 305 CE.

In an effort to win popular approval for his new form of government, Augustus funded lavish religious celebrations honoring the traditional gods of Rome. His “games of the century” commenced with blood stained animal sacrifice—eighteen sheep and eighteen goats had their throats slit, their blood drained away, and their flesh grilled at an ancient site supposedly visited by underworld gods—Pluto and his underworld companions—on the opening day. On subsequent days elaborate ritual festivals to various Roman deities—Juno first, then Terra Mater (Earth Mother)—took place in the environs of Rome, capped off when Augustus brought to the Palatine a sculpture of Apollo, voice of the Oracles, his own patron deity.

In the long run this strategy of masking dictatorial power in traditional Roman gods failed. It succeeded in China. But it proved ineffective in the Roman Empire. Why?

The answer lies in the ideological pendulum swing. In the struggle between different attitudes toward the polytheistic divinities of the Greek pantheon that were basically
inseparable from the Roman pantheon. Recall that Greek comedy belittled the gods, challenging their virtue. Recall that one whole school of Greek thought rejected the existence of a transcendental world altogether, the atomists, the materialists, the skeptics. Atheism and agnosticism were alive and well in the Hellenic age.

None of this went away. Hellenism gave way to Hellenistic culture that spread rapidly throughout a far wider region – into Asia Minor, into Egypt, even unto India - than the Aegean and the mainland of Greece proper. Epicurus picked up the baton from the atomists promoting a materialist theory that gained popularity amongst the Roman nobility. In *The Nature of Things* the poet Lucretius pushes this view to its atheist extremes:

> “When prostrate upon earth lay human life/Visibly trampled down and foully crushed/Beneath Religion’s cruelty .... /With horrible aspect, first did a man of Greece/Dare to lift up his mortal eyes against her/a conqueror he returns to us, bringing back/knowledge .../Therefore now has Religion been cast down/Beneath men’s feet, and trampled on in its turn/Ourselves heaven-high his victory exalts.”

Not a popular poem during most of the medieval period to say the least!

Testimony to the spread of theories of reality devoid of appeal to deities amongst educated Romans is the writing of Cicero. In the late 50s BCE, he penned an essay that imagined a debate between a Stoic, an Epicurean, and an Academic. Occupying the middle ground the Academic argues one should act as if the gods existed regardless of whether it is true or not. Practical wisdom perhaps: but hardly an endorsement of the Greek or Roman pantheons.
Adding to skepticism about the Roman gods championed by Augustus was the spread of salvation and mystery cults, particularly amongst the illiterate and downtrodden, amongst soldiers and slaves, both groups facing brutal corporal punishment for disobedience on a daily basis. One of these cults Mithraism appears to have enjoyed Persian Zoroastrian roots. Mithra was Indo-European god, one of the three judges in the Zoroastrian pantheon charged with guiding souls. A variant of his name shows up in the Hindu *Rig Veda* so it is likely he is derivative of proto-Indo-Iranian-European worship. In any event having made its way in the Roman Empire his image as a bull slaying god, Goodness dedicated to defeating Evil, he was worshipped in caves by devotee communities organized along lines similar to early Christianity, bishops, deacons and presbyters taking command of ceremonies.

On top of this were the Hebrew people who violently resisted the Seleucids – the two books of Maccabees provides us with tantalizing accounts – even contemplating an alliance with the Romans in order to drive back the Hellenistic powers. Once the Romans took charge of the land of Canaan what a thorn in the Roman side they became! Of course this particular confrontation – that eventually ushered in the violent destruction of Jerusalem’s Second Temple in 70 CE and the bloody Bar Kokhba revolt – involved a religion profoundly different from Roman religion. Monotheist it celebrated the relationship between the one single deity and His chosen people. Yahweh was a jealous god protective of His special people.

Particularly troublesome to the Hebrews was the fact that their history was pockmarked with military defeats at the hands of more powerful rivals: Assyrians, Byzantines, Persians, Seleucids had invaded their territories, taken some off as prisoners and slaves, humiliating their
one god. Moreover many Jews found the religious beliefs of their conquerors superior to their own. Fear of Greek influence, for instance, was especially pronounced amongst the Sadducees, a group aligned closely with the priesthood. Equally problematic was the fact that they – in accordance with standard Roman practice – were required to pay tribute taxes to the Roman authorities, levies that were used to build Roman style structures celebrating their Roman gods throughout the lands of Judah and Israel. Resistance to these financial demands was a major issue amongst the Hebrew peoples.

Pushing its way into this heady religious brew – occupied by old Roman and Greek gods, mystery cults, monotheistic faiths, atheism and the like - was a spinoff of the Hebrew faith, one emerging out of idea of a Messiah that would save His people. How? Perhaps through a war of cosmic violence, a final battle between Sons of Light and the Sons of Darkness, between the evil Kittim and the righteous, an apocalyptic idea made popular amongst the ascetic sect of Essenes as recorded in the famous Dead Sea scrolls. Perhaps salvation would come through military action directed by the war leader Messiah. Or as the followers of one of the putative Messiahs would have it: through faith in Jesus of Nazareth, preacher of a gospel of love, leader of a band of devotees from Galilee, determined to purify the Hebrew faith of the corruption visited on it by cynical Sadducee priests, extracting rents out of the gifts showered on the Second Temple by worshippers. Crucified by the Romans at the request of the Great Sanhedrin of judges seated at the Second Temple, Jesus emerged as a Messiah savior first among Jews, later on upon gentiles, the faith embodied in a variety of cults that – like the Mithra cult – spread throughout the Roman Empire in the first and second centuries CE. Like the Mithra cult worship in the early
Christian communities was organized along bishop/deacon/presbyter lines. Like the Mithra cult this faith became popular amongst soldiers recruited in Roman armies.

**One God, One Emperor**

Between the effort of Augustus to revive the Roman deities as a mask for despotic largely military rule and the invoking of one version of Christianity – Nicene Catholicism – as the official religion of the Roman Empire, an act taken by the Emperor Theodosius at the end of the fourth century, the pendulum swung dramatically. It swung within the field of Roman politics. It swung within the annals of Christianity itself. As it transpired the two swings, initially separate, were firmly joined together at the hip once the Edict of Milan in 313 CE declared Christianity legal throughout the empire.

The problem faced by early Roman Emperors was legitimacy. What Chinese Emperors were able to achieve by appealing to the lofty ideological notion of a Confucian “Mandate of Heaven” - as justification for their harsh laws, as motivator of their bureaucracy, as spur for their troops supposedly guaranteeing victories - was simply not a viable option in the Roman Empire. Religious diversity precluded it. In its absence successful predation was the only sure guarantor of political stability.

To be sure Augustus attempted to appeal to the traditional Roman gods. However this was the same Augustus who created the elite group Praetorian guards stationed in Rome with the aim of protecting his personage, with the aim of heading off coups instigated by ambitious rivals. As it turned out the Praetorian guards became despoiler, as well as protector, of
Augustus’s successors.\textsuperscript{30} One indicator of the instability arising from the role of the Praetorian guards is the number of Emperors who died by natural causes. From the reign of Caligula to the reign of Trajan, ten individuals were declared Emperor by the Senate. Of these only three died of natural causes. The typical reign was short. Claudius and Nero both enjoyed reigns of over thirteen years, but Nero, knowing the Senate had condemned him and lacking military backing, ended up committing suicide.

To be sure between 96 CE and 192 CE, the Nerva-Antonine dynasty was able to reestablish stability. Trajan was Emperor for almost two decades; both Hadrian and Antoninus Pius managed to stay on the throne over twenty years; and Marcus Aurelius reigned for nineteen years. But this was a period when the empire was still expanding, notably achieving conquests in Asia Minor.

In the wake of Nerva-Antonine rule, the pendulum swung back. In the year 193 CE there were five contenders for Emperor as the Praetorian guards auctioned off the post to the highest bidder. Caracalla managed to hang on for over seventeen years (he was joint emperor for thirteen years) and Severus Alexander was uncontested for thirteen years but most of the emperors between 193 CE and 235 CE enjoyed reigns of less than four years, and almost everyone died of unnatural causes. The empire was no longer growing. Predation was turning on itself. Generals were just as likely to attack each other as to war against the so-called barbarians threatening the empire along the perimeter of the great defensive shield their predecessors had managed to cobble together.
Indeed over the ensuing fifty years chaos ruled. Civil wars sapping the ranks of the armies ran roughshod over commerce, merchants terrified to travel the great road networks that had fueled comparative advantage during the heyday of the empire. Adding to the woes of the economy was plague (the Plague of Cyprian raged for two decades) and the onset of cool summers, depleting agrarian yields. Testimony to the centripetal forces at work, in 268 CE the empire had split apart into two regions: a Gallic empire consisting of Gaul/Britannia/Hispania (the last sub-region moving in and out of the jurisdiction); and a Palmyrene empire consisting of Syria, Palestine and Egypt. Of the twenty six claimants to the emperorship, a generous definition of natural cause of death only yields five names (two perishing due to plague), the remainder either killed in battle or overthrown and executed in bloody coups. In point of fact two emperors only served twenty one days in office; two lasted between two and three months; and another ruled under eleven months. The pendulum had swung toward complete disunion as predation became increasingly cannibalistic.

In a successful bid to reunite the empire and bring to a conclusion the internecine warfare tearing the empire apart Diocletian took power in 285 CE. He was determined to restructure the bureaucracy and reestablish religious legitimacy for the position of emperor. To achieve the former goal he created a Tetrachy consisting of two co-emperors (augusti) and two subordinate junior emperors (caesars). To quell unrest in the fractured Senate he banned the practice of appointing powerful senators to high military posts. To cloak military dictatorship with legitimacy to the throne he took the title “Dominus and Deus”, abolishing Augustus’s title of “Princeips Civitatis”. As well he worked assiduously to reestablish respect for the traditional
Roman gods. In doing so he earned the ire of the Christians living in the empire as he declared their practices illegal. Without a doubt part of his animus toward the religious cults popping up throughout the empire was his assertion that they were greedy, jacking up prices just like the merchants and rapacious landlords. At least this is what the language in the prologue to his famous Edict on Maximum Prices (301 CE) suggests. Astute to the end he determined to live out his elderly years in peace, dying a natural death rather than falling victim to ambitious subordinates. With this in mind he resigned the emperorship in 305 CE, building a estate on the coast of Asia Minor far from Rome.

Now the pendulum swung back with a vengeance. Civil war broke out. In the most famous of the face-offs between the rival claimants to the post of Emperor Constantine, leading an army assembled in the western reaches of the empire took on Maxentius at the Battle of the Milvian Bridge in 312 CE. Without doubt Constantine was a mythic charismatic figure – some Christians he was the thirteenth apostle – but the myth cloaked hardnosed political machinations. Whether he was really committed to Christianity or simply believed that it would be advantageous to select one of the many deities in play throughout the empire as his personal transcendental patron, a deity that many of his soldiers were committed to, is unclear. What we do know is that he decided to make the chi-rho insignia (the two letters forming the beginning of the name of Christ (Greek for Messiah) the symbolic guarantor of victory at the Milvian Bridge battle. In anticipation of the engagement he ordered fashioned a tall pole covered with gold crossed with a bar in the image of a cross, festooned on the top with a wreath displaying the chi-rho letters, the rho intersected by the chi. As well he had the chi-rho
imagery placed on the shields of his soldiers and on his own helmet. Perhaps all he had in mind was that he required a divine protector for this decisive confrontation, Christ appearing to be the most powerful god he could invoke, hitting upon chi-rho symbolism as a solution. That Jesus preached nonviolence did not seem to bother him in the slightest.

In any event Constantine prevailed at the Milvian Bridge. As a result he was determined to favor his adopted religion, probably reasoning that it would shower legitimacy over his rule. As co-emperor with Licinius (an arrangement that lasted until 324 CE at which point it end with Constantine’s victory over his co-ruler) he legalized Christianity with the Edict of Milan. Moreover he ordered a temple to Aphrodite that had been constructed by the Romans in the vicinity of Jerusalem be re-consecrated as the Church of the Holy Sepulcher. Most important he convened a famous council of bishops that met at Nicaea in 325 CE.

Constantine was politically attuned enough to realize that if Christianity had any chance of becoming an official religion of the Roman Empire someone had to hammer out agreement among the competing variants of Christianity, or at least favor one variant over the other competitors. At Nicaea the main issue that needed resolution turned on a single Greek word “homoousia” (one in being, of the same substance).

What was at stake in a subtle choice of words, specifically in the choice of the “homoousia”. What was at stake was correctness in ritual. To be precise, correctness in the ritual of baptism that introduced the newly baptized to the Christian world. By dint of priest controlled ritual, the baptized individual was placed onto a particular path clearly overshadowed by a kind of arithmetic. At the end of the path that for each and every Christian
was life on earth, a mere prelude to a potentially more glorious afterlife, was a moral
calculation. The arithmetic involved weighed up a lifetime’s accumulated sins up against a list of
righteous virtuous deeds. Think about it as an ethical bank account: the fate of the soul in a
future afterlife hinging upon it.

The fact is the gathering at Nicaea was bent on defining orthodoxy and its opposite
heresy. Emerging out of the Hebrew faith at a time when many different views on religion
clashed and contested, Christian belief and practice took on decisively different hues depending
on the other faiths it interacted with. One version was Gnosticism. According to this view
Jesus Christ was never of flesh and bone. He only appeared in human form like some apparition.
Again followers of Marcion rejected the notion that Christ had been born of a woman. Not only
belief but behavior was at issue. Followers of the gospel according to Montanus - prevalent
particularly in Asia Minor where apocalyptic writings like Gospel of John and the Book of
Revelation flourished – practiced strict ascetic rituals, avoiding eating and sex, even following
female prophet leaders. In short Christianity in its initial centuries was highly diverse.

The particular sectarian division that excited the assembled bishops at Nicaea was
whether Arius was right or wrong. Arius took the position that the Father was superior to the
Son whom he created. The father was eternal but the Son was not: He was the Father’s first
creation. Hence the word “homoousia” should not appear in the creed used at the critical
moment of baptism. The Father and the Son were not of the same substance, they were not
inseparably bound together in all eternity.
Why did this matter? As I myself to not profess to be an expert on this question I can only speculate, some critics might say naively. In my reading one reason why Arianism – the theory that Arius’s interpretation was correct – was controversial is that it invoked an image of blood sacrifice. The Father creates the Son, proceeding to abandon Him, permitting Him to be killed as a sacrifice.

In any event whatever connotations Arius’s position had for abstruse theology were overshadowed by Church politics. It divided the faithful along geographical fault lines. The eastern branch of the Church, the Greek speaking contingent as opposed to the Latin speaking contingent, favored Arianism.

In the upshot Arius’s position was decisively voted down at Nicaea. Arius was exiled to Illyria. His writings were declared heretical. They were to be assembled and burned. Anyone caught holding onto his writings were to be executed. The Nicene Creed incorporating the idea of “homoousia” was declared orthodox, the only version that was acceptable at baptism ceremonies.

The Council of Nicaea was not simply concerned with banishing Arianism. It began the process of issuing canon law, declaring among other things that self-castration was unacceptable (some Christian extremists believed castration was required for purification), readmission of lapsed Christians to the faith was acceptable, and priests should be barred from practicing usury. But the most important action it took was the declaring of Arianism as heretical. As it turned out this proved to be much harder to enforce than the bishops and the priests who accompanied them to Nicaea could have possibly dreamed.
Indeed as soon as Constantine died the Arian controversy was reignited. If Constantine believed that the issue was laid to rest at his deathbed – great sinner that he was he cleverly resisted being baptized until he was about to draw his last breath – he was naïve. Upon his death, three of his sons – Constantine II, Constantius II, and Constans I – met to carve up the empire between them (an agreement that did not last long as they quarreled, ultimately warring against one another). To guarantee that no other family members were able to claim a share they had all other potential rivals executed. Immediately they split along doctrinal lines. Constantine II and Constantius favored Arianism; Constans I supported the Nicene position. The facts on the ground led to these splits: bishops were becoming increasingly important in advising emperors or co-emperors. Some bishops, particularly those in the eastern region of the empire, were closet if not overt Arians. This reality set the pendulum swinging against Nicene Christianity.

Remarkably the religious pendulum swung into a new direction when Julian became emperor. In an ultimately vain attempt to reject Christianity he attempted to revive Roman and Greek belief systems. He had a special passion for Neo-Platonism, a dualistic theory that adamantly rejected materialism as corrupt and impure. As well he was fascinated with Mithraism; espousing belief in the transmigration of the soul he toyed with the notion that he was Alexander the Great reincorporated. Trying to cobble together an umbrella of non-Christian belief systems he issued an edict guaranteeing freedom of religion, and encouraged non-Christians to attack Christian communities.
Ironically at Julian’s demise the pendulum violently swung the other way. The Valentinian dynasty assumed power. Valentinian I supported the Nicene Creed but his co-
augustus Valens supported Arianism. At least they were Christians unlike “pagan” Julian, albeit Christians of two different stripes. Valentinian II followed: he was raised under the influence of an Arian mother but leaned very heavily on Ambrose the Nicene bishop of Milan. His successor Theodosius I leaned even more heavily on Ambrose. He declared Nicene Christianity the official religion of the empire; he dissolved the order of Vestal Virgins; he ordered the razing of the Temple of Apollo in Delphi and the Serapeum – devoted to Serapis a synthetic Hellenistic-Egyptian deity combining Osiris and Apis – in Alexandria.

Were Arianism the only problem tearing apart Christianity some kind of compromise might have been possible between the two variants of the faith. But this was not the case. A so-called Donatist community of Christians – named after Donatus a prominent member of the group – was active in North Africa, particularly among Berber tribes. They argued Christians should be pure. The Church is the bride of Christ; it should be unblemished. Sinners should be discouraged from entering it its doors. To Saint Augustine of Hippo this was anathema. He argued that no one could be pure. All of humanity was swimming in vile sinfulness. The best one could do is being humble, hoping God had chosen you to be among the elect who God in His infinite wisdom had selected for salvation, a decision that was predetermined and out of your control. Along similar lines Augustine opposed the views of Pelagus. He maintained Pelagianism was arrogant, assuming people could freely walk righteously by acts of free will. Not surprisingly monks who aspired to purity found Augustine’s position problematic.
Not only did Augustine and Pelagius differ on the issue of free will and determinism. They had profoundly different views about wealth. Pelagius believed that the rich should give away their wealth, following the example of Jesus and his disciples to embrace voluntary poverty, to live in an Essene-like religious communist community, to dedicate themselves to immaterial gift exchange rather than to grimy odoriferous animal sacrifice and to the erection of awe inspiring edifices like the Second Temple. By imbibing true Christian values the fervent believer could walk in the way of the Lord. In contrast Augustine took a worldly, arguably more practical, attitude toward the wealthy Christian community. He argued that the wealthy should give their riches to the church that would in turn feed and nurture the poor and downtrodden. A church dedicated to reaching out to the masses was a church that was amassing good wealth, mirroring in its mission to the impoverished the treasures awaiting those fortunate persons whose souls were bound for salvation in the afterlife.

As the Roman Empire collapsed in the fifth century, as the Vandals poured into North Africa, as Rome was sacked in 410 CE, Christians found themselves on the defensive once again. The “pagan” old guard argued that failure to worship the traditional Roman deities was the reason the empire was drowning. In his reply Augustine wrote the text that would reverberate throughout the medieval period - a book Charlemagne declared was his favorite – *The City of God and the City of the World*. In it he laid out his thesis concerning predestination. God decides who is to be saved and who is to be damned. Those destined for salvation may be active members of the Christian community, or they may not be. They constitute the City of God. Some persons destined for salvation dwell temporarily in the City of the World that is
hopelessly violent, hopelessly corrupted by sinfulness. They are the elect and the Church needs to reach out to them despite their apparent unrighteous behavior induced to be sure by the dog-eat-dog reality of the City of the World. Claims that one can voluntarily guarantee admission to the City of God through acts of free will, through extreme ascetic devotion for instance – in short views advanced by Donatists or Pelagians – are misguided.

Other highly respected individuals holding sway amongst the ranks of Nicene intelligentsia favored a more benign version of Augustine’s position. Perhaps they were simply more pragmatic, attempting to throw open the doors of the orthodox faith to soldiers and wealthy landlords exploiting slaves. Their variant treated Christ as a benevolent judge that could – and would – pardon the sins of the penitent, in short a kind of divine emperor issuing pardons on a regular basis.

The bottom line is that the controversies over Arianism, Donatism and Pelagianism and the sharp demarcation between the City of God (the religious authority) and the City of the World (the secular authority) did not vanish. They became part and parcel of the great ideological pendulum swings of the medieval period.

Part II: Merchant Capitalism and the Pendulum Swing

Consolidating Catholicism and Feudalism: The Great Pendulum Swing of Early Medieval Europe

Between the fifth century and the end of the eleventh century ideological and material pendulum swings rocked the west. To some degree ideas and material forces moved together.
In the ideological dimension fierce competition between Arianism and Nicene Christianity dominated the early medieval centuries, known somewhat unfairly as the dark ages. From the seventh century onward Islam emerged as ideological contender with Christianity. As well it loomed large as a military and political contender to the Christian west. In short order Islamic armies managed to subdue much of the region that Hellenistic followed by Roman armies had held sway over. Between southern Iberia running through North Africa, through Egypt, through most Mediterranean waters, across much of Anatolia and the Arabian Desert, through Persia and even unto northern India Islamic forces managed to cement together a huge empire rivaling in territorial terms anything Roman forces had been able to hold in sway.

In responding to the challenges of Arianism first, later Islam, the Roman church struggled with ideological and material swings induced within the region. On the one hand the church thrived on decentralized feudalism because it could pit feudal lords against one another in cowing secular power. On the other hand in countering Arianism, in combating Islam, the church depended heavily on convincing secular overlords, kings. Convincing a king who loosely controlled – through bonds of fealty – feudal lords and their knights to convert to Nicene Christianity proved to be an effective weapon in bringing populations under the aegis of the Roman church. Convincing powerful kings to assemble a sufficiently formidable army to hold back Saracen invasions – or hostile Lombard forays – was necessary if Rome and Christian Europe was able to survive as a potent Christian zone firmly rooted at one end of the Eurasian land mass.
In short the pendulum swung back and forth between decentralized feudalism and centralized kingdoms, between Roman Catholicism and Arianism within Europe; and between Islam and Christianity in much of the old Roman Empire.

Consider feudalism first. Commencing in the second century CE, a process described by Beckwith (2009: 95 ff) as the Great Wanderings of Peoples took place in Central Asia. To the west, Germanic peoples crashed their way in the Roman Empire, some settling within its boundaries, some seizing territory on its frontier. Further east in the Persian Empire that competed with the Romans for territories in the Fertile Crescent, Chionites and Hephthalites carried out successful invasions. In the north-east China Mongolic peoples penetrated southward. The billiard balls were in turbulent motion.

Finally the Huns emerged as movers and shakers on the steppe lands. Driving Alans and Goths out of niches they had once established, pressuring the other tribes in Central Asia, they pushed barbarians into the great agrarian zones of Eurasia. China split apart only to be reunified centuries later under the Sui, Tang, and Sung dynasties. Still Chinese dismemberment was nothing like the terrible fate Europe experienced. In characterizing the Europe zone Beckwith (2009) describes the attendant disruption as complete and total re-Central Eurasianization. The classical age came to an end; the period known as either the Dark Ages or the Barbaric Period commenced.

How civilize the barbarians who rode roughshod over an increasingly Christianized Roman Empire? Compatibility between the Central Asian Culture Complex and Christian dogma had to be managed somehow. One approach was the Church’s proliferation of saints, martyrs
in the struggle to bring barbarian opponents around to the true civilization. Advertise extreme devotion: hopefully it will trump loyalty to the comitatus. Two forms of gift exchange were confronting each other: the trick was how to cement them together.

As it turns out the concept of purgatory worked wonders for the two parties. Incorporating views propounded by theologians, Saint Augustine and advocates of Christ as a merciful imperial judge the idea of purgatory as a physical place located between Heaven and Hell evolved in the centuries of imperial collapse. Ultimately it rested on fear that the Second Coming of Christ, the Final Judgment was imminent. Souls ultimately destined for Heaven - not Hell - who died without securing sufficient remission from sin during their lifetimes to justify immediate entry into Heaven spent time in purgatory where their suffering and abasements paid off a debt owed God. Once paid, once sufficiently purified, they could move on to paradise. Church sanctioned prayers offered for them during their lifetimes and prayers offered by those who directed their contributions to the church in the honor of the deceased could reduce the time spent in purgatory.

What better institutions for organizing prayers for the deceased than monasteries? Monks devoted hours and hours at day to solemn prayer. Surely they could be induced to pray for a powerful feudal overlord who had set aside land for their structures. To boot monasteries were organized along hierarchical lines, not too dissimilar to a comitatus. Under the principle of Benedictine monastic rule the abbot of the monastery became all powerful, meting out physical punishments to underling monks. Loyalty to the abbot’s harsh rule was the watchword. This form of organization surely exercised a strong fascination to those following the rules of the
comitatus. To the chief of a Germanic tribe the two organizations did not seem so different. Moreover practical concerns were not insignificant. A comitatus head adhering to primogeniture found convenient dispatching non-inheriting offspring to monasteries established in the territories under his control. With this in mind, local rulers doled out land to monks who were required to toil as part of their training. Monasteries ended up specializing in farming. In principle monks worked in the fields. Or in the monasteries where copying manuscripts and prayer took precedence in the litany of tasks assigned the devout, monks at least managed farmland that was actively tended by serfs, slaves and tenant farmers.


“Except for a few saints, no passage to heaven was easy. The soul required all the prayers that it could get... the great of the [Merovingian] land .... sought protection for their souls through gifts to the church...It was this high-pitched view of the Last Judgment that accounted for the mounting fortunes of the church. Contemporary records of donations showed this with clarity...”

Purgatory opened the doors of the secular church to a massive inflow of earthly treasure. As well it allowed the monasteries to amass huge tracts of land set aside by feudal lords for the care of their souls.

In the upshot decentralized feudalism spread over Western Europe. With the Christian empire carved up in the west – the Byzantine remnant alone maintaining a dual system of emperor dominance, Eastern Christianity serving as a masking device – Rome had little choice but to compromise with local feudal lords and/or with the kings who tried to weld together loose confederations of recalcitrant tribes. In doing so they were forced to surrender undisturbed control over the churches and monasteries established within their domains. In
contrast to the Byzantine situation – secular rule trumping religious rule – Western Christendom ended up with a power sharing arrangement, control over loyalty and resources oscillating between Saint Augustine’s City of God and City of the World.

Not only was the Roman Church forced to compromise with decentralized feudalism. As well it had to consolidate its ideological hegemony over western Christianity, driving Arianism under the ground. In this struggle its main success came from dealing with kings to whom feudal lords owed fealty.

A key breakthrough for the Roman Church came in the wake of the establishment of the Merovingian dynasty who, marching out of lands allocated to them north of the Rhine by the Romans swept aside Visigoths, Saxons, and Alemanni confederations. The Visigoth rulers had committed themselves to the Arian position; the Salian Franks who established Merovingian rule over a huge chunk of central Gaul were not Christian at all. However Clovis - the second Merovingian king who proved remarkably successful in winning battles against other federations - eventually bringing under Merovingian rule most of Iberia, all of Gaul, and lands stretching to the Rhine. Prior to one of his major wars Nicene Christian bishops convinced him he could eke out victory if he converted to Christianity. Upon his conversion around 500 – reminiscent of Constantine’s conversion a century and a half earlier - he and his successors proved loyal to his bishopric advisors, granting lands and structures housing abbeys and monasteries, even members of the royal dynasty choosing to become bishops.

Division of Clovis’s territorial conquests among his four sons set in motion a process of subdivision eventually weakening the kingdom. With time royal control over the Frankish lands
dissolved, real power falling into the hands of mayors of the palace. Fear of ongoing Islamic aggression in the late seventh and eighth centuries spurred on Pope Zachary to dissolve the Merovingian dynasty in 752, his successor Pope Steven II formally transferring rule to the first Carolingian king, Pepin the Short in 754. It was an astute move. After all Pepin’s son, the ruthless, despotic Charles Martel had defeated the Moorish invaders at Tours in 732, turning the tide against the Islamic invasion of Europe.

Even with the creation of the successor to Frankish rule with the formal investing of Carolingian leader Charlemagne as the Holy Roman Emperor by the Pope in 800 CE – an act that surely angered the Byzantine Emperor, driving a wedge between the two branches of Nicene Christianity - feudal decentralization, fragmentation, remained a hard cold reality in Western Europe. In effect three parties wrestled for control over the resources allocated to Christian organizations, notably the monasteries and bishoprics: the Holy See in Rome; the Holy Roman Emperor; and the feudal lords.

In effect gift exchange – either in its feudal guise as fealty or in its religious guise as devotion to the church and its putative commitment to serve the poor and pray for the souls of the departed – came to dominate the division of the social surplus in the west. Predation came second: competing feudal fiefdoms vied with one another; kings overthrew other kings. The Merovingians supplanted the Visigoths; the Merovingians lost their legitimacy, stripped of power by a more powerful legitimating political force, the Papacy. Commerce was a much depleted third claimant, particularly as markets collapsed evinced by the atrophy and ultimate destruction of many of the ancient Roman roads.
How and why did Islam emerge as a mighty claimant to many of the regions controlled by the Romans? In its heyday the Roman Empire had expanded on all fronts. It pushed out into the Middle East and the Levant in addition to gaining a strong foothold in Egypt and northern Africa. It expanded to the east to exploit Silk Road trade opportunities. It did so to draw a militarized barrier, a line in the sand, with its Persian imperial rivals. Merchants caught in the middle between these two mighty foes – in Syria, Iraq, and the Arabian Peninsula - naturally took advantage of the situation, acting as intermediaries transporting goods from Red Sea ports and merchant dominated cities in old Fertile Crescent to western India and onward to China. Two avenues were available to them. One was the caravan moving through desert lands. The other was seafaring: taking advantage of the winds to traverse the Arabian Sea, arriving at the Bay of Cambay where Barygaza was located.

Great Middle Eastern trade centers flourished under these circumstances. The earliest to emerge as a major commercial powerhouse was Petra, populated by Nabataeans who settled down in a Jordanian ravine, handling the transshipment of goods between the Gulf of Aqaba on the Red Sea and the east. Key to their choice of locale was avoiding the clash of arms between Romans and Parthian/Persians quarrelling over the lands once held by the Seleucid Empire. Eclectic in their choice of gods, the Nabataean faith incorporated Greek, Roman, Mesopotamian, Persian and Egyptian deities into their shrines, statues and rituals. Along the Silk Road religions clashed and congealed as merchants came together to truck and barter their wares.
There is nothing like competition. In this case, competition for riches with which jewel encrusted temples could be erected. Consider the other end of the Silk Road. After the barbarian invasions of the Great Wandering dismembered China, spinning off nomadic dominated dynasties in the north, the Northern Wei Empire established a foothold between the Central Asian steppe and the remnant of the Han Empire now relegated to the south. To differentiate themselves from the Confucian dominated south, the rulers of the Northern Wei chose to base their legitimacy on Buddhism, hoping to make this the dominant religion of a China ultimately unified under their aegis. The carving of monumental Buddhist figures played an instrumental role in their patronage campaign. What better way to advertise your commitment? 33

Motivated by a similar goal, consolidating legitimacy, the ruler of the once nomadic Yuezhi, also embraced Buddhism, promoting a variant of the faith more compatible with the gift giving practices key to the comitatus. The resulting faith, Mahayana Buddhism, promoted the giving of Seven Treasure donations (the luxury goods of the Silk Road) to Buddhist monasteries and stupa, a veritable entry fee to securing a place in the Buddhist inspired paradises populated by Bodhisattvas. Not surprising over time the carving of Buddha figures spread, skirting along the fringes of the Takla Makan desert, spilling down into what is today’s Afghanistan.

In short the Silk Road trade did increase religious competition for merchant wealth. Is it surprising that eventually a religion justifying merchant activity emerged? To be sure, nothing is inevitable; however momentum is important. It is difficult to escape the feeling that a religion
compatible with the idea of credit creating mobile capital, a religion embracing merchant values, would eventually emerge somewhere along the Silk Road.

And so it did: in Mecca.\(^{34}\)

Early seventh century Mecca was somewhat similar to Petra. Christian tribes, Jewish tribes and pagan tribes competed and cooperated. There they watered their camels; haggled over the prices of cloth, wine, leather, grain, spices and frankincense; and argued over which faith was superior to the others. Like Petra, it was extremely commercial and extremely ecumenical.

To prevent the internecine fighting between tribes that plagued caravan trafficking across the Arabian Peninsula connecting the Red Sea to the Arabian Sea the tribes worked out a clever arrangement. They made sacred space out of what was de facto commercial and diplomatic space. A border of stones was laid around Mecca. Within this space attacks against competitor tribes were anathema. At the heart of Mecca was the Ka’ba a holy temple. Myth and tradition swirled around this structure. Did Abraham’s son born to Hagar, Ishmael, sanctify it? That it was mentioned in the Hebrew Scriptures – in Psalm 84 where a pilgrimage to the Valley of Baca is mentioned – suggests it was associated with Abraham the “original monotheist.” Was its interior decorated with a painting of Jesus and the Virgin Mary? In any event during the early seventh century the Ka’ba was under the control of the Quraysh who worshipped a pagan god, Hubal.
This was the world of the young Muhammad. Born into one of Mecca’s noble families - his father tragically deceased before he emerged from the womb - Muhammad followed in the footsteps of his tribal elders, becoming a shepherd first, later a highly successful merchant. It was only later that he became the prophet – according to Islam the Last Prophet, continuing a prophetic line created first by Abraham, extended by Joseph son of Jacob and Moses, continued on by Jesus – establishing a pure form of monotheism.

Driven out of Mecca by the Quraysh, Muhammad led his followers to Medina where he consolidated his political base, ultimately returning to Mecca, defeating his Quraysh opponents in a holy war (jihad), and ultimately gaining control over the Ka'ba in the name of one god Allah. Over the course of his remarkable career, Muhammad progressed - from lowly shepherd to wealthy merchant to suffering prophet attacked by powerful enemies to political leader, even a military leader fierce in leading troops in combat – finally becoming powerful benefactor to the poor, advocating the type of gift exchange that Saint Augustine had championed during the final collapse of the Roman Empire.

Once more, emerges the suffering Socratic like religious hero who – through countless travails and grinding hardship - wrestles forth spiritual triumph from an impure world sullied by misconceptions and error. Remarkably for the first time the suffering hero leaves a legacy extolling the merchant. Granted acquiring riches for the mere sake of acquiring riches is frowned upon. Granted the Christians are right in condemning usury. Still trade itself is admirable. Indeed submission to Allah means submission to peaceful transaction, to honest commerce.
The Qur’an makes the last point crystal clear:

“Cling one and all to the faith of Allah and let nothing divide you. Remember the favors He has bestowed upon you: How He united your hearts when you were enemies, so that you are now brothers through His grace; and how He delivered you from the abyss of fire when you were on the very brink of it.”

Once you were enemies raiding each other’s caravans, slaughtering each other out of devotion to false deities whose worship accomplished nothing for you, simply preparing you for an afterlife of everlasting torment and incineration. Now, thanks to Allah’s mercy, you are free to trade; better yet you are freed from fear of everlasting torment in the fires of hell.

There is little doubt that Muhammad - growing up in a world alive with Christianity, Judaism, Manichaeism, Gnosticism, and paganism - viewed the program of belief he fervently espoused was revealed to him by the Angel Gabriel as the final step on the road to purification. The “people of the book” had managed to distort the true message of Abraham. Judaism was tribal, exclusionary; Christians failed at elementary arithmetic, confusing three with one. The Qur’an and the thousands of oral statements (hadith, sunnah) made by the prophet were revealed truth, mischievous error having been cleansed. Islam was pure monotheism.

In the aftermath of Muhammad’s demise, the problem of how to rule under Islamic principles, how to carry on commerce on Islamic principles, how to carry on warfare under Islamic principles, and how to treat peoples conquered by the Arabs (the first group to embrace Islam), became acute. After all, Muhammad was an unusual religious hero: he was at once prophet, merchant, administrator and warrior all wrapped up into one. During the first three
generations of Islamic life – the so-called era of the righteous salaf, of the purest generations, of the righteous ancestors of contemporary Islam – sorting out these issues involved much bloodshed, much disputation, and the planting of seeds of future division and dissension. Still one thing was clear: Islam was a faith that could be readily exploited as a mask for despotic secular rule. After all, the founder of the faith had functioned as secular ruler and military strategist. In competing against western Christendom rife with tension between secular and religious authority Islam had a decided advantage.

From the perspective of this paper that explores the relationship between capitalism and religious faith the most important issues involve treatment of non-Islamic peoples; the development of legal theories concerning contracting, credit creation and corporations; and the uniting of secular rule with religious rule. With no claim to a comprehensive treatment a few comments about each issue – admittedly cursory - are essential.

Exploiting weaknesses in the Byzantine Roman and Persian Empires, the territories that fell to the armies of Islamic rulers – the caliph – increased dramatically in the aftermath of Muhammad’s demise. Under the first three of the Rashidun, the so-called Rightly Guided Caliphs -Umar, Umar ibn Khattab, and Uthman ibn Affan - Persia, Egypt, and a huge swath of territory was incorporated into the Caliphate governed empire. During the short-lived rule of Ali, son-in-law and cousin of Muhammad, the last of the Rashidun, a fierce civil war broke out between various factions striving to grasp control of the empire. To be sure aggrandizing power was crucial but so was principle. Muhammad had been both prophet, anointed religious leader, as well as administrator and war leader.
Which was more important: a religious devotee listening to the voice of Allah – channeling doctrinal concepts, ideas, onto a secular map – or a materialistically oriented king aggrandizing territory that could exploited through control of Silk Trade routes and promotion of agricultural development, bolstering the foundations upon which religiously oriented gift exchange could thrive? The faction supporting Ali became known Shi’a: they believed in the religious devotee should take precedence. The majority faction, the Sunni, supporting a king dominant model, overthrew Ali’s faction after the establishment of the Umayyad Caliphate. However in pointing to ideological differences between the two schools of thought it is important to keep in mind that the line dividing secular and religious was far thinner – far less clearly demarcated – in Islam than it was in the Roman Christianity consolidated in the fourth and fifth centuries. Far more important to the schism within Islam – at least in the first few centuries of Islamic hegemony over the lands Islamic armies conquered - was interpretation of a particular set of historical events involving Ali. After all, Ali had been the fourth Caliph. No deep divide between the City of God and the City of the World.

Under the Umayyad Caliphate territorial expansion continued. Central Asian territory was added on: the Caucasus, Transoxiana, Sindh (the Indus River basin), the Maghreb, and a major chunk of the Iberian Peninsula. Unfortunately this proved to the Umayyad’s undoing. During the mid-700s CE a faction opposed to Umayyad rule – bankrolled by powerful merchants, relying upon Central Asian Turkish, Persian and Georgian slave troops (the Mamluk) – overthrew the Umayyads, the heir to the Umayyad dynasty fleeing to Iberia where he established the Emirate or Caliphate of Corboda.
In sum, within a very brief period a vast number of communities adhering to diverse religious backgrounds were brought under Islamic rule. The problem was high to treat them. Three options were available: convert to Islam; remain non-Muslim, becoming dhimmis, who were required to pay a special tax (jizya) for the privilege of receiving military security from the Muslim community; or die by the sword.

There were some advantages to being a dhimmi. Under the Pact of Umar dhimmis had the option of using non-Muslim courts to settle disputes. Subject to the proviso that they were dealing with other dhimmis and not Muslims, the Pact allowed non-Muslims to either access Muslim courts – four major schools of religiously inspired Islamic law existed although in practice it was easy to move between the courts – or to seek judgment elsewhere. Muslims, however, were only allowed to use one of the branches of Muslim jurisprudence. Moreover, because Muslims could not renounce their religion, become apostates, without being subject to capital punishment, Muslims could not escape their own religiously inspired law, largely drawn from the Qur’an and the hadith, with reasoning based on rational debate free of scripture playing a relatively minor role in three of the four legal schools.

Another potential advantage of being dhimmi was the possibility of practicing primogeniture. Islamic law frowned on it, perhaps because the traditions of the Qur’an and the hadith were initially developed amongst trading communities using highly divisible, mobile, capital rather than land. Equal division of inheritance tended to fragment both the holding of mobile capital and land ownership.
In any event Islamic law was very favorable to trade. Under the principle that interaction between travelling merchants (\textit{al-Tajir as-Saffar}) and resident merchants (\textit{al-Tajir al-Muqim}) should be encouraged in order to facilitate Silk Road commerce, judgments allowing writing of bill of exchanges became the law of the Islamic world by the mid-eighth century. The fact that the Abbasid Caliphate had enjoyed strong merchant backing in its protracted struggle to unseat Umayyad dominance certainly did not hurt the cause of facilitating long-distance, mobile capital, business. As described by Rubin (2010) it became common practice for a bill of exchange (\textit{suftaja}) that required payment of a debt by a certain date to be rigorously enforced by the Islamic courts. Individual A loans individual B a specified sum to be repaid by individual C on such and such a date. In exchange for receiving the funds, B issues a bill of exchange to A. A fee is charged for the loan. Dealing in a common currency – ubiquitous throughout the Islamic world – no currency arbitrage is involved. However interest is implicitly reckoned in the set of transactions governed by the issue of a \textit{suftaja}. The fee charged is implicit interest.

The bill of exchange was an ingenious device for creating mobile capital linked to credit creation. In principle the Qur’an denounced usury with greater force than did early Christianity – after all the Council of Nicaea forbad priests from engaging in usury but not the laity – as is made abundantly clear in a famous Sūrah: \textsuperscript{39}

\begin{quote}
“O you who believe, keep you duty to Allah and relinquish what remains [due] from usury.”
\end{quote}

The idea is unrighteous profit is bad but exchange is good: interest (\textit{riba}) is unacceptable, presumably because it is exploitative, impure. In practice as opposed to principle Islamic law
permitted interest. The bill of exchange is one device for charging interest. The other device is sharing returns on investment. If A wants to secure interest from B because B has an investment opportunity the two parties can agree to share any profits accruing to B’s management of the funds. Under this subterfuge A is basically securing interest: the share of profits relative to the amount of funds loaned (to compute the rate one needs to take into account the length of time it takes for the fruits of the investment to be realized).

Moreover Islamic law allowed for other devices that promoted capital accumulation. One was the *waqf*, the trust. Under Islamic law a *waqf* could be created by a benefactor. Once set up the conditions of the trust were not to be changed. The primary motive for arranging an Islamic trust was charity, a basic principle laid down by Muhammad who ended his life as a benefactor to the poor. Typically trusts were set up for the construction and maintenance of fixed capital, hospitals or schools for instance. Still “cash *waqf*” were allowed, suggesting a degree of flexibility. That said, one of the major themes emphasized by Kuran (2011) is that the *waqf* was not the equivalent of the Western corporation. There are two obvious reasons: most *waqf* were set up to provide the destitute with food and medical services; and the benefactor’s stipulations were binding. To be true to the principles of Islam, the state needed a system of welfare. Countenancing the *waqf* was one way to accomplish this goal. Allowing it to morph into a profit making corporation was not in the interests of the state.

That Islam was highly favorable to credit creating mobile capital is clear from the fact that Karimi merchants became fantastically wealthy under the Mamluk Sultanate of Cairo. Enjoying virtual monopolies in the spice trade, and dabbling in the African slave trade, some of
the greatest fortunes assembled (on a global basis) during the period of the late Middle Ages were put together by an elite group of Karimi merchant houses. \(^{40}\)

Reflecting its trade driven commercial success during the period of Abbasid Caliphate rule (750 – 1517 CE), it is not surprising that Islam experienced a Golden Age. Indeed Findlay and O’Rourke (2007) suggest that the blossoming of trade is associated with innovation in general. During the period 750 to 1300 it was the Islamic world, not the Latin Christian world that translated the Greek writings of Aristotle, Ptolemy, and Galen. \(^{41}\) It was the Islamic world that built on the works of the great Greek philosophers, astronomers, map makers and medical theorists, improving their calculations, in some cases disputing the rectitude of their doctrines. It was Baghdad, the Abbasid capital that housed great libraries during Europe’s early medieval period. Not Paris, not Rome, not London. It was the Islamic world that developed the astrolabe, an ingenious device used for determining the direction to Mecca – crucial for proper Muslim prayer – with useful spinoffs to seafaring and land travel.

Given its early lead in developing merchant capitalism why did the Islamic world collapse into an era of stagnation? As Kuran (2011: 68 ff) emphasizes the share of commerce in the labor force of the Islamic world declined between the period 701 – 1100 CE and the period 1101 – 1500 CE. By contrast after 1200 CE it was Western Europe - not the Islamic world – where commercial innovation blossomed, where major advances in merchant capitalism and science were being made.

One popular theory – that growing religious homogenization due to the decline in the share of the *dhimmi* population in Islamic societies (more and more people having converted to
Islam presumably to avoid paying the jizya tax or to escape other forms of discrimination or because they viewed Islam as superior to their native faiths) – has been questioned by scholars. To be sure the idea that a purifying form of Islamic fundamentalism gained prominence, strangling innovative thinking is reasonable. The Abbasids were corrupt. Over time the luxury of their court became increasingly abhorrent, outright disgusting, to those steeped in the study of the Qur’an. That a purifying movement aimed at returning Islam to the age of the salaf occurred is not only plausible but actually true seems to bear out the key premise of this thesis. However the burden of Saliba (2007) is that there is no evidence for a decline in the productivity of Islamic philosophers, astronomers and mathematicians during the thirteenth and fourteenth centuries, precisely the period when the purification movements were in their ascendency.

Other theories point to trade diversion. Brought on first by the Mongol invasions of the thirteenth century weakening if not destroying Islamic hold over Silk Road commerce, later by European trade expansion in the fifteenth and sixteenth centuries, the vitality of Muslim trade was sapped out. Of this there is little doubt.

However an even more compelling explanation cannot fail to impress: the fact that Islam makes little if no distinction between the sacred and the secular. In his book Lost in the Sacred Diner (2009) makes this claim. The shadow of Muhammad, Islam’s great hero, looms over the Islamic community. By contrast in Catholic Christian Europe a distinction between the secular and the sacred existed from the days of the Roman Empire. Grafting the Central Asian Culture Complex onto Christianity yielded a feudal Europe in which the divorce between the
secular and the sacred actually grew wider, even as Christianity evolved from being a minority religion in the days of Constantine, triumphing to become the only religion of any consequence by the time of the Crusades. ⁴²

The fact that the ideological pendulum swing did not swing back and forth between the secular and the religious within the Islamic – despite the nuances separating Shi’a and Sunni, despite the treasure trove of Greek thought that fell into Islamic hands – was its ultimate undoing. It is not enough to read the classics of the Axial Age; you have to live it, incorporate into it your material and ideological being. This happened in western Christendom. It did not happen in Byzantine Christendom; it did not happen in Islam.

*The Pendulum Swing of the High Medieval Period: Simony and the Crusades*

During the early medieval period the church bettered its secular opponents, extracting resources from the social surplus at a phenomenal rate. To be sure a powerful ruler like Charlemagne maintained an opulent court, albeit one dedicated to Christian worship. Still under his guidance and the wisdom of his successors, resources were found permitting the court to acquire ancient Greek and Latin texts, scribes being employed in the task of transferring their contents to durable vellum (instead of papyrus). ⁴³ As well fielding armies was a costly business. Charlemagne induced Pope Leo III to crown him Holy Roman Emperor on Christmas day, 800, because he had led troops over the Alps, defeating Lombard troops threatening the territorial claims of the Papacy. ⁴⁴ The pope was prepared to sell titles, to confer legitimacy of secular rulers, provided a material quid-pro-quo was in the offing.
A wealthy church inevitably became a corrupt church. Unmonitored gift exchange, the outright graft that purgatory was becoming, was undermining the values propounded by Jesus. It weakened the legitimacy of the very institution supposedly devoted to espousing the doctrines of its founders. In doing so the corruption called into question the legitimacy the church was conferring on secular rulers.

The church had become big business. Many bishops enjoyed incomes accrued from magnificent estates; often even the rank in file parish priest secured a comfortable living from the wealth accumulated by the church. How pure, how well informed in the doctrines of the church was a typical priest? Not much. Standards were not high. Most priests married or bedded concubines; many practiced magic, sanctifying fields prior to spring planting with non-Christian arguably pagan rituals, carrying out questionable exorcisms, making money off the sale of forged relics, promoting the cult of the dead, purifying water for the Sunday sacraments for remuneration. The wealth of the church was corrupting its minions. Not surprisingly the papacy itself was up for sale. Powerful Roman families vied to put their children on the papal throne. A teenager even held the post.

The practice of turning the church’s income generating opportunities into saleable commodities is known as simony. Russell describes it:

“It was customary for the king to sell bishoprics; this in fact, provided a substantial part of his income. The bishop, in turn, sold such ecclesiastical preferment as was in his power. There was no secret about this. Gerbert (Sylvester II) represented his bishops as saying ‘I gave gold and I received the episcopate; but yet I do not fear to receive it back if I behave as I should. I ordain a priest and I receive gold; I make a deacon and I receive a heap of silver. Behold the gold which I have once more ... [put back into] my purse.’”
All of this raised problems. Not surprisingly the proposals the cynical clergy put forward were completely at variance with the proposals sincere reformers advanced. The cynical wanted the church to wrest away the take from the secular rulers; the sincere wanted to clean up the whole mess, purifying the operation of the ecclesiastical hierarchy.

All of this came to a head in the investiture controversy, pitting the youthful Holy Roman Emperor Henry IV against Pope Gregory VII. Setting off the struggle was Henry’s appointment of his candidate as archbishop of Milan. Gregory rejected Henry’s right to make the appointment, excommunicating Henry. Without a doubt Gregory hoped to turn Henry’s feudal underlings against Henry. Henry responded by calling together a synod of German bishops at Worms that issued a declaration accusing Gregory of being a usurper, a polluter of the Papal office. In the aftermath a famous arrangement, a cynical arrangement was hammered out between the Holy See and the Holy Roman Emperor, one that echoed down to the nineteenth century when Bismarck used it as a stick to attack Catholicism in Germany. Henry travelled to Canossa in 1077 arriving as a barefoot supplicant, a penitent who was requesting forgiveness for his sins, asking for absolution from Gregory. In fact a quid-pro-quo involving Imperial military support for the Pope underlay the exquisite farce. Even more farcical was the ultimate denouement. Gregory gathered up his forces in 1084, sending them across the Alps where they occupied Rome, sending Gregory packing to a fortress in Saint Angelo where the Pope put out a bid for support from the Normans. All of this turned dark for Rome. The Normans did beat back Henry IV’s forces but they also burned down a third of the city while
Gregory ended his life as a virtual prisoner of the Normans who ostensibly were doing his bidding.

Ultimately the investiture controversy was put to rest at the Concordat of Worms in 1122. Under the compromise hammered out bishops were to be elected by the church in accordance with canon law. In return the Emperor was permitted to witness the actual appointment. In practice secular authority continued to exercise influence over bishopric politics.

The hard cold geopolitical reality is that the papacy was caught between a protector - that could and did turn itself against the Holy See when it felt its interests were at stake - and the threat of Islamic invasion. That Catholic Europe was fragmented made it vulnerable to Islamic attack. The fear was not without foundation. Islamic armies had wrestled away Northern Africa, Egypt and the Levant from the Byzantine Empires in the past; and they were threatening to seize more Christian territory in Anatolia. To the east Islamic armies had defeated Chinese troops at the Talus River and had turned parts of the Indian subcontinent into Muslim controlled regions.

Moreover Islam was a threat to Christian Europe in ways largely irrelevant to the peoples of China and India. Caliphs controlled Jerusalem and the Holy Land. How important this bitter fact was to European Christendom is revealed by the fact European maps crafted during the medieval period placed Jerusalem at the world’s center. Islamic rulers could and did prevent pilgrims from worshipping at sites holy to both Christians and Jews. Sharing sacred space was a major issue. To cite a particularly telling example: the al Aqsa mosque – erected to
celebrate Muhammad’s ascent into Heaven - was built upon to the ruins of the Jew’s Second Temple all but crushed to bits by Roman troops fighting Jewish militants.

Moreover Christians were second class citizens, *dhimmis*, in the Islamic Empire. From a Christian perspective they were discriminated against. How valid was the western Christian critique of Muslim oppression of Christians is a contentious issue. Who knows? Few if any Muslims lived in Christian lands. Consider the fact that Christian lands were not particularly hospitable to the Jews who probably fared better under Caliphate rule than they did in the Holy Roman Empire.47

Add to these long festering concerns the fact that the papacy was mired in a complex political struggle with the Holy Roman Emperor, diverse groups of feudal lords, and the Byzantine Patriarch (the great schism dividing the Catholic and Greek Orthodox faiths had just occurred in the mid-eleventh century). With all of this pressuring it the papacy decided to make a dramatic gesture asserting its dominance, issuing a call for crusades directed against the Islamic world in the closing decade of the eleventh century.

How important economic prowess factored into the reasoning of the Papacy is an intriguing question. According to the military power equation elaborated in footnote #5, military potential (\(M\)) depends upon the level of overall economic output (\(Y\)):

\[
M = \frac{(mY)}{p_{mf}} = \frac{(myP)}{p_{mf}}
\]

Where \(m\) is the military conversion rate (equalling the percentage of total economic output devoted to obtaining human and capital resources used in warfare); \(P\) is population; and \(p_{mf}\) is
the relative price of exerting a unit of military force (relative to other goods in the economy).
Deflating the share of the economy devoted to the military by the relative price of actually
implementing action on the battlefield ($p_{mf}$) – the prices of swords, lances, horses, armor,
relative to consumer prices – adjusts the resources devoted to the military sub-economy for
their actual effectiveness. It reflects the technology of warfare. Consider the crusades. They
raged for approximately two centuries after 1096 CE pitting feudal knights riding on horseback
against Islamic cavalry encased in relatively comparable armor, both sides using swords and
lances whose manufacture had been gradually perfected over centuries. Not surprisingly the
combatants employed relatively similar shock tactics in battle since they were basically armed
the same way.

Think of the military power equation this way: imagine a pie representing total
economic activity is cut into two wedges, a military sub-economy and a civilian sub-economy.
Resources – human, animal and inanimate – are employed in both sub-sectors. How this
allocation is to be determined and how effective it is depends on politics: upon the individual or
individuals ordering the use of armed force; upon who acquires the funds supporting the
training and employment of armies and navies.

The easiest case to envision is a non-fragmented system, central rulers raising funds to
fight wars. Some of these funds are allocated for purchase of swords, horses, siege machinery
and a navy; some are used to employ soldiers, to pay for their upkeep when they are training as
well as when they are in combat. The proportion of the entire economy allocated to military
powers – the ratio of the military economy to the entire economy – is $m$. To secure the funds
the ruler taxes the population. Under Islamic principles, *dhimmi* were not expected to fight but they paid higher taxes than Muslims, therefore avoiding the call to military service. The relevant population figure the Moslem world was working with was the total population - Muslims plus *dhimmis* - because that constituted its fiscal base. Its base for recruiting soldiers was the Muslim population – and slaves purchased or taken in warfare - under its rule. From a management point of view this system has the huge advantage of a centralized command structure.

In actual fact political infighting in the Muslim world had weakened the caliphate. It had splintered into a few competing regions, though into nothing like the crazy quilt fragmentation of western Christendom. For the west the question was simple: who was going to bear the costs of fielding troops in the Holy Land? For its part the papacy imposed special taxes, controversial and resisted by parishioners and secular rulers alike. Ultimately the church had to secure the commitment of kings who could draw upon feudal retainers for assistance. Kings responded by demanding fiefs and their dependent monasteries supply warriors. Ultimately the principal supplier of military hardware and personnel was the agglomeration of feudal estates maintaining cadres of knights. The rents earned by feudal lords from their fiefs loomed large in the financing of the military sector of the economy. Cajoling the various actors into participating in a coordinated military action was politically tricky. In short funding and managing the crusades proved a daunting economic proposition for Christian Europe.

Ultimately the pope had no choice: it had to declare crusades a Holy War, the Christian answer to Islam’s *jihad*. Offer remission from sins, reduced time in purgatory, guaranteed
arrival in Paradise, to the knights. Borrow from the book inspired by the teachings of Muhammad.

Employing the ideology of Holy War as a rallying cry resolved some recruitment problems but did not completely eliminate the problem of economic size. Under a regime in which the technology of killing commanded by military units rests upon an equal technological playing field – the Crusades being a prime example - economic variables – the levels of y, and P (total economic performance Y equaling the product of y and P) – throw a huge shadow over the cold blooded calculus of warfare. Given the Islamic advantage in trade and credit creation – hence a probable advantage in per capita income – European envy of Islamic merchant capitalism is totally understandable.

Learn from your enemies. Imitate those things upon which their economic superiority resides. This is the lesson that the European merchants took from the ultimately futile effort of Christian crusaders to take control of the Holy Land.

The Europeans enjoying the most sustained contact with the Muslims were the merchants of Genoa and Venice. Small city states dominated by powerful merchant interests, able to keep a lid on pressure of Catholic Church, Genoa and Venice were actively involved in shipping Crusaders back and forth to the Levant, contesting the eastern end of the Mediterranean with Byzantine and Islamic traders. The saying “a Genoese and therefore a merchant” speaks for itself. Not surprisingly Genoese and Venetian merchants were innovators in adapting the Islamic bill of exchange to the European market.
It is a great historical irony that crusades called for religious reasons - ultimately ending in military failure for the Europeans - brought the Christian world into direct contact with the Islamic world. That contact laid down the foundations of merchant capitalism in the west; that contact renewed interest in Greek knowledge in the west. In short, dealing with the challenge posed by Islam set into motion pendulum swings both material and intellectual: in practical economic relations; in ideas about the nature of the physical world and how best to extract reliable information about that world.

The spread of merchant capitalism coming in the wake of western penetration into the Islamic world played a pivotal role in bringing feudalism to an end. The forces unleashed by the associated legitimization of commercial ideology – expressed in a remarkable explosion of monetary bribes required for success in secular and religious elections – eroded the legitimacy the Catholic church exercised over the operation of gift exchange in European lands. At the same time coming to terms with Islamic learning induced beleaguered church and ambitious secular figures to cope with ancient thought and practice in all of its dimensions, ushering in a struggle between Scholasticism and its arch rival alchemy.

The Pendulum Swing of the Late Medieval Period: Merchant Capitalism versus Feudalism, Catholic Church Inquisition versus Neo-Donatist Sectarianism, Scholasticism versus Alchemy

Once transmitted to Europe, merchant capitalism took off with a vengeance. The back and forth struggle between secular and authority gave it a mighty fillip absent in the Islamic arena.
In fragmented Europe the bill of exchange was a more potent vehicle for extending credit and charging interest than it was in the Islamic world. Issuing bills of exchange negotiated in a market using a currency differing from that currency where the bill is originally drawn up generates a rate of return. This is above and beyond the return offered by drawing up a suftaja. For this reason the bill of exchange became a more potent instrument in fragmented Europe where currencies tended to be unique to localities than in Islam where there was one and only one officially sanctioned currency. One of the consequences was a weakening of the power of rulers. Negotiating bills of exchange ultimately impacted exchange rates between realms. Merchants could undermine, counterbalance, the effort of feudal rulers easing a debt burden by debasing the currency of their realms.48

The bill of exchange is the father of the bank check. The principal difference is the fact banks deal with many customers who are mostly anonymous, unknown to one other. Pushing the envelope of the bill of exchange, making it the cornerstone for banks charging interest on loans seems like a small step. Indeed it is provided the religious authorities do not squelch it. In Islam where state and religion tended to coincide it was a step merchants and trusts were not easily able to take. They did not push the envelope. In Europe, fragmented, enjoying the use of secular as well as religious courts, the step was easier to take.49

Having taken the step in Italy, important improvements and refinements were open for experimenting. The famous hub-and-spoke system creating legally separable partnerships was introduced by the Medici enterprise in the fourteenth and fifteenth centuries.50 It consisted of a partnership (the hub) managing the affairs of numerous subsidiary partnerships (spokes).
business affairs of each spoke, run by a branch manager, were operated along tracks separate from the other spokes. Theoretically the entire fiscal umbrella, the hub, bore responsibility for the debts accrued by the spoke managers who bore unlimited liability. In practice – reflecting the fact that each spoke kept its own books and the fact that pursuing legal action against the hub was costly (given the fragmentation characteristic of the hub-spoke system) - creditors assumed the individual branches were independent. This limited the liability of the Medici system as a whole.

This was a foray along the path leading to acceptance of limited liability incorporation. In setting up incorporation – an action pursued by the nascent European centers of learning modeled on the trust concept pioneered by Muslims – Europeans pushed the envelope on pooling capital for business purposes. The great trading companies emergent with Mercantilism – the Dutch VOC, the English East India and Hudson Bay Companies – drew upon earlier steps taken by universities and banking concerns. The result was the limited liability joint-stock enterprise, gathering in funds from a deep pool of subscribers in order to engage seafarers in global commerce during the age of European exploration and conquest. Mercantilism was business or rather merchant commerce managed in the interest of the state. It is hardly surprising that legal support for the initiatives leading to limited liability joint-stock commerce came largely from secular courts, not Catholic courts.

Not only did the crusades promote merchant capitalism by putting Christians into direct contact with Islamic merchants. They also led to trade expansion within Europe. As monks, lay people and knights bristling with chainmail traversed Europe in growing numbers the wayfarers
demanded foodstuffs and services along the way. Market towns sprang up in response to the surging demand. Fairs bringing together merchants from diverse lands prospered. Urbanization was given a strong fillip. So was the mobility of capital.

The gradual transformation of Europe from a system of rural feudal fiefs to a system revolving around market towns and fairs ushered in a reversal in the relationship between secular and spiritual space. Under the feudalism of the early medieval era - the period between say 500 and 1200 CE that basically came to an end with the inglorious sacking of Constantinople and the seizing of holy relics (nails from the true cross included) from the Byzantines by the knights of Catholic Christendom – spiritual space mainly consisted of rural monasteries. Many had been set up as the invading Eurasian tribes invading the defunct Roman Empire were incorporated into Christendom. Many of the newly formed monasteries were basically handed over to lay patrons, feudal lords, as part of their fiefs. Into the monasteries went the oblates, the non-inheriting children procreated by feudal elites. The reason was simple: under Germanic inheritance law estates were supposed to be divided between sons, a fact that undid the Merovingian and Carolingian dynasties. Staving off this eventuality was a major reason why oblates were pushed off into monastic orders. Naturally, powerful lay patrons wanted to draw upon this very same pool of literate elites raised upon their own estates in negotiating with monasteries over who was to be appointed abbots. This was why corruption crept into the ranks of the monasteries, adding to the woes of a church struggling with simony in the appointment of the secular church hierarchy: elites accustomed to consuming luxuries
populated the upper echelons of church and monastery alike. This was the reason why the investiture crisis cut such a wide swath across Europe.

Given on-going backsliding, new monastic orders emerged in waves.\textsuperscript{51} In each case – Cluny in the tenth century, the Cistercian order in the twelfth century – the professed aim of the founder was purifying monastic life. In each case time eroded the dreamed for commitment to the Benedictine Rule. The Carthusian monks claimed bragging rights because they were less like to deviate from the rule than Benedictines, Cluniacs, and Cistercians.

Not surprisingly as credit creation spread in the secular community the monasteries, increasingly wallowing in materialism, took advantage of their privileges to extract rents. Monasteries carrying the fruits of their vineyards and flour mills evaded paying tolls on bridges maintained by feudal estates. They began to loan out money at interest; they began to borrow to build structures where they could house traveling elites, feudal lords, even powerful merchants. Increasingly they became quasi-secular. Given the decisions hammered out a Nicaea in 324 banning usury these practices smacked of blatant hypocrisy. Still there was a loophole: the ban on loaning out money at interest applied to priests, not to monks or professional managers employed by monasteries. That the church was deeply mortified about this practice might explain why it extended its ban on usury to the laity at the Third Lateran Council of 1179. Or, alternatively, was the church hierarchy taking this position in an attempt to hang onto a quasi-monopoly over the credit market? In any case the temptation to take advantage of its vast asset holdings was too appealing. By 1300 lawyers employed by the Holy
See came up with a list of thirteen conditions – under the flimsiest of excuses – that permitting loaning out of money at interest.

To some it felt like money was undermining gift exchange in all of its dimensions. Fried (2015: 257) writes:

“...the beginnings of European high finance are found in the same period ..... [it got to the point that people replaced] ‘Christ’ in the old refrain with money ‘Money is the victor, money is the king, money reigns supreme over all ....[the election of a Holy Roman Emperor following the death of Henry VI] was made possible only by financing it with massive sums in bribery, which Cologne merchants and money brokers ... transferred from England to the Holy Roman Empire.”

Commerce was taking the upper hand over the gift exchange dominated world of early medieval Europe.

The drift of the church into a commerce and corruption did not go unnoticed by Christians seeking a pure form of the gospel of Jesus. Reviving the purifying principles of Donatism, breakaway sects spread. While tendencies in this direction had bubbled beneath the waters before the twelfth century, it was with the French Cathar rebellion of the 1100s that the split between so-called heretics and Roman church elite ignited a smoldering tinderbox.\textsuperscript{52}

Cathar society was divided into two sub-groups, the perfects (\textit{perfecti}) and believers (\textit{credentes}). The prefects committed themselves to chastity. If married, they abandoned conjugal relations. Accepting poverty, they divested themselves of worldly goods, embracing a apostolic life of preaching, missionaries for a true faith.

Along similar lines around 1170 a wealthy merchant named Waldes who became obsessed with the story of the prodigal son, deciding to sell off his property, spreading the
monies he received among the poor. Becoming a lightning rod for those seeking a life of Christian purity, Waldes emerged as focus of a growing group of individuals bent on evangelical perfection. Remarkably they concluded that the idea of purgatory – one of the main engines for the accumulation of church wealth – was anathema. It was not mentioned in the New Testament. Equally remarkably Waldensian congregations even allowed meritorious females to preach.

Both of these movements threatened the church’s monopoly over Nicene Christian ideology. The Roman church hierarchy sensed it was boxed into a corner. As the neo-Donatist movements spread like wildfire it responded. First it tried excommunication. When this failed it launched crusades against the Cathars and the Waldensians, enlisting the assistance of kings and feudal lords. The Cathar stronghold of Carcassonne was summarily attacked in 1209, the Cathars violently expelled. When these methods failed to beat out the schismatic flames into dying embers, it created the papal inquisition. The avowed purpose of the inquisition was to bring heretics back into the folds of the mother church.

It was with the aim of reconverting heretics to Roman orthodoxy that the Dominican order was created. From the outset Dominic’s strategy was based on impressing the recalcitrant. Advertising their sincerity with the shining example of Dominican purity, members of the order displayed sophisticated argumentation in carrying out their inquisitions, attempting to outthink the heretics placed under their care in inquisitorial prisons. Ferreting out recruits from newly formed guilds cum universities, they specialized in keeping up with the latest knowledge embraced by European intelligentsia. This meant ancient Greek and Latin
learning absorbed and modified by generations of Muslim and Jewish scholars active in the Islamic world. Of these the most important writings were those of Avicenna and Averroes, philosophers employed by the caliphs in Cordova, and the Jewish physician and philosopher Moses ben Maimon (Maimonides) whose *Guide for the Perplexed* was devoted to reconciling Hebrew monotheism with Aristotle’s collected works. In his deeply thought out treatise Maimonides carefully plucked out those parts of Aristotle consistent with monotheism, discarding ideas like the eternity of the universe that was inconsistent with the notion of a creator god.

That both Islamic and Jewish scholars had managed to bridge the gulf between monotheism bathed in prophecy and miracles and the systematic analysis of natural and political order achieved by Aristotle paved the way for Dominican scholars, notably Thomas Aquinas writing in the thirteenth century. In his *Summa Theologiae* (*Handbook of Theology*) managed to construct a mighty intellectual edifice reconciling Aristotle’s scientific approach with Christian revelation. In so doing, he turned Saint Augustine on his head. Augustine’s vision was a Platonic one; Thomas Aquinas’s vision was Aristotelian. Although controversial at first – Aquinas’s works were burned and condemned – the reconciliation achieved by Dominicans like Thomas Aquinas became the solid foundation on which the ideology of scholasticism ultimately declared orthodox by Rome was erected.

Dominicans – later on joined by the Franciscans who were also utilized by the papacy in implementing the inquisition – became the backbone of the mendicant orders spreading the gospel in the rapidly growing cities and towns springing up in the wake of the commercial
transformation of Europe. As the composition of population concentration shifted toward market oriented towns and conurbations, the most dedicated Christians joined mendicant friars, preaching the gospel to city dwellers. And like their monastic counterparts, over time they drifted into aggrandizing rents. One notable example: they began to offer hallowed cemeteries to congregants, cutting into the monopolies once enjoyed by the churches.

During the late medieval period the symbol of the secularization of space – the eroding of spiritual space at the expense of the secular – was the gothic cathedral standing grand and tall with its flying buttresses and its magnificent stained glass windows. More than anything else these imposing architectural feats testify to the wealth amassed in powerful towns and cities. Funded by tithes, grants from merchants and local feudal lords, the point of the gothic cathedral was to advertise. Come here: you can do business; our people are prosperous. Maybe you want to borrow from the very groups that assembled treasure chests for the erection of the massive Church structures rivaling the pyramids in grandeur, surpassing the structures celebrating the power of the Pharaohs due to their Biblical purity? After all, the gothic structures drew directly upon ancient Biblical traditions. Supposedly their dimensions were based on what King Solomon and his priestly advisors worked out in constructing the first Temple devoted to the worship of Yahweh at Jerusalem. Tellingly, on the outer walls of the gothic cathedrals often appeared figures represented Plato, Aristotle, Galen and Ptolemy. That they celebrated Greek learning was a material spinoff of the ideas inherent in scholasticism.

Scholasticism as a movement designed to counter heresies breaking out in western Christendom had limited success. Part of the problem was inherent in to resolving the tension
between natural law and divine law. This is a step onto a highly slippery path. If natural law exists – if it governs motion on the earth, the movement of the planets, the manufacture of iron and steel according to chemical principles, the relationship of the bodily organs to one another; if it explains why people are greedy – what is the purpose of divine law? If natural laws are operating why do miracles occur? And what are miracles? Why does a deity need to rely on miracles in convincing humanity that it should act in a way that contradicts natural law? Why the confusion?

Not surprisingly scholasticism was also incapable of holding Catholic Christendom together in a single communion. Reform movements aimed at cleaning up corruption in the Church – at the Vatican in Rome, in the monasteries, in the groups of mendicant Friars – continued to arise, then fail. How could a purified form of Christianity be fashioned? Attempts at radical reform – notably the movement led by Jan Hus in Bohemia – ended in failure. Rome promoted yet another bloody crusade wiping out the valiant effort of followers of Hus (Hus himself, given a guarantee of safety by Church authorities who proceeded to renege on the deal, was burned at the stake) who barricaded themselves behind wagons aligned in a circle, positioning cannons between the wagons to drive off the crusaders.

What finally led to victory of so-called heretics like Hus – notably Luther and Calvin – was the printing press. Once relatively cheaply produced bibles appeared the door was thrown open a path promoting a form of Christianity that refused to make use of Church priests and monasteries, a form of worship that appealed to those who had basic literacy. And who needed literacy? Merchants of course: they needed to read written contracts.
Not surprisingly the rise of Protestantism in the sixteenth century had special appeal to two groups: merchants and local feudal rulers. It appealed to merchants because they could read; because they could advertise their rectitude by joining a congregation committed to fervent promotion of Christian principles in daily life; and because they could openly avoid the ban on usury. Because it gave them an excuse to abolish the monasteries, securing their assets, disbanding their brotherhoods and sisterhoods it appealed to feudal lords who found themselves sinking into fiscal traps, indebted to powerful merchants and their banks. Ironically Protestant sects like Calvinism adopted Saint Augustine’s notion of predestination, defiantly throwing up at the face of a corrupt Roman church the ideas espoused by one of their most hallowed founding figures.

A second reason why scholasticism failed had less to do with faith more to do to with flaws in the scientific principles laid down by Aristotle. While Aristotle’s biological researches were fashioned upon detailed observations, his physics and his cosmology were totally deductive. Classic examples are his claims that nature abhors a vacuum; that the planets revolve around the earth in circular orbits; that complete unblemished perfection exists in the realm of the fixed stars occupying the outer ring of the cosmos. Lacking suitable observations Aristotle had fashioned his views whole cloth from a priori theoretical principles. Eschewing experiments he had no way of testing out the laws of nature he deduced from his governing principles. How misleading following Aristotelian logic could be is illustrated by an account given in Fara (2009: 82) describing a scholastic explanation for the outbreak of the Black Death advanced by university physicians in Paris. According to their reasoning an unusual conjunction
of planets had occurred four years earlier. Hot Jupiter had sucked up immoral vapors from the earth. In turn the vapors exploded into fire by being in the presence of a dried out evildoing planet Mars. All of this celestial chaos corrupted the atmosphere, spreading disease among humans living on the face of the earth.

The problem is that practical people had been carrying on experiments for millennia. Embracing mundane materialism – smelting metals, cooking, drying out herbs for remedies, cauterizing wounds – groups of inventors flourished throughout Eurasia, busying themselves with experiments. In Western Europe they were known as alchemists. Convinced that they were privileged beneficiaries granted insight into esoteric knowledge, alchemists operated under principles supposedly granted them by special non-Christian gods. Especially prominent among their host of occult gods was Hermes Trismegistus. Hermes Trismegistus was one of the shadowy gods emerging from a pure amalgamation. On the one hand Hermes drew from the Greek god of commerce, trickery, deviousness, transformer, associated with the wild frontier. To Hermes was attached characteristics of the Egyptian god Thoth, conjurer of spirits, adept in Gnostic knowledge, magician. The resulting deity was passed down from Roman times to the European late Medieval Period through Islamic philosophers. It was known as Hermetic philosophy.

Hermetic philosophy became an underground tradition – underground because it was not specifically tied to Christianity, indeed it was positively frowned on by the Catholic clergy who may have viewed it as a competitor to the magical rituals they performed in the Eucharist – in both European scientific and artisan circles. It was mystical in a Gnostic sense because it
purported to unlock esoteric secrets of the universe that only intellectual virtuosi could plumb. In making much of mystical fifth element, an elixir, the pursuit of Hermetic knowledge known as alchemy smacked of magic. Ironically it inspired icons of natural philosophy like Bacon and Newton.\textsuperscript{54}

Alchemy in the variant that reached Europeans in the late medieval period was rooted in Greek philosophy and ancient alchemical practice redacted through an Islamic lens. Aristotle’s theories of motion and medicine were the philosophical cornerstones. The basic idea was simple and compelling. There are four natural elements (earth, water, fire and air) and there are four humors (black bile, yellow bile, phlegm, and blood). Sharing the same number cannot be an accident. They must correspond to one another. Earth corresponds to black bile: it is cold and dry. Fire corresponds to yellow bile: it is dry and hot. Water corresponds to phlegm: it is cold and wet. Air corresponds to blood: it is wet and hot.

Now earth is the realm where everything gets jumbled up. Things are not in their natural places, they are out of sync. They are mixed together in a welter of confusion. The terrestrial world is corrupt, shot through with impurities. It is the place where change can and does take place as witnessed by the motion constantly observed on it, motion involving the transformation of air or water. Purification must be possible because transformation is possible. Evidence one can transform things is abundant: apply fire to water altering the nature of water, turning it into air. Following this logic, impure metals like lead can be transformed into purer metals like silver by rearranging the elements within it. As well silver can be turned into gold, the purest metal of all.\textsuperscript{55}
Islamic philosophers interpreting Aristotle during the golden age of Islam reasoned that a fifth substance – they called it *al-iksir*, the word from which the English term elixir is derived – could produce the transformation. The existence of this special substance, this elixir, was the core of alchemic mysticism. It has come to be known as the Philosopher’s Stone.

As Leicester (1965) emphasizes alchemy was practiced in many regions within the Eurasian world. The Chinese knew of it. Indeed Needham (1981: 31) argues that Chinese alchemists discovered gunpowder before 900, dubbing it a “fire chemical” (*huo yao*). Before long the fire chemical was being utilized in warfare, first as flame thrower, later on (eleventh century) in the manufacture of land mines, bombs and grenades. Ancient India knew of it. Certainly Islamic thinkers thought it important though its conceptual validity was a matter of healthy debate. Once it made its way into Europe via Islam it became entrenched there. Even if the Church despised it secular rulers maintained an active interest in it, inviting alchemists to their courts for demonstrations. That rulers had an active interest in it is hardly surprising: turning alloys of metal into pure gold would facilitate issuing of coinage. It would reduce costs. Moreover proper use of the Philosopher’s Stone might well have huge benefits for health and longevity. After all Aristotle’s theory suggested that there were important correspondences between the micro-environment of the human body with its various organs and the macro-environment of the universe.

Given the religious-like search for purification central to alchemy it is hardly surprising that the field could – and actually did - become increasingly wrapped up in mysticism. Indeed this appears to have been the case in China where it eventually merged with Taoism and later
Neo-Confucianism. It appears to have reached a similar dead-end in the Islamic world, fueling philosophical speculation leading onto intellectual cul-de-sacs.

As it turns out European alchemy did not reach a dead end. It was gradually transformed into chemistry. But before that transformation was effected it produced illustrious figures who became bitter enemies of scholasticism. One was Paracelsus. Philosopher, physician, botanist, astrologer, occultist, founder of toxicology, medical surgeon attached to the military, Paracelsus was a remarkable dynamo strutting across the historical stage during the fifteenth and sixteenth centuries.

As a practitioner of alchemy Paracelsus had great faith in laboratory work, respecting barber-surgeons, apothecaries the type of people who dirtied their hands in the muck and truck of material reality. Indeed when he became professor at the University of Basel he invited these practitioners of the “arts” – think artifice, manipulation of reality, experimentation – he invited a legion of non-academics to illustrate real world phenomena before his students. Paracelsus was an ardent opponent of scholasticism. For instance arguing the Aristotle and Galen were totally incorrect in their theory of the four humors, he replaced their key categories with a trinity of essential elements: mercury, sulfur and salt. True alchemist he attached occult meanings to these elements. Mercury embodied spirit and mind; sulfur embodied soul; salt was the essence of the body. Using chemical compounds fashioned from these elements, he professed to cure people of diseases. Imbalance in the four humors – as advocated by Hippocrates and Galen – was not the cause of illness. Rather disease was due to a dearth of
harmony in the body that could be usefully addressed with the chemical and mineral concoctions he created through experimentation.

Alchemists and astrologers akin to Paracelsus flourished in the secular world. In the courts of kings, in the palaces gracing feudal estates, they found ample opportunities to carry on their trades. They were a thorn in the side of the scholasticism adopted by the churchmen. They laid the foundation for practical experimentation that began to loom large during the scientific revolution. As well they spread skepticism about the validity of scholastic theorizing a second essential ingredient to the scientific revolution.

The rise of merchant capitalism in Europe was driven by expansion in trade both within Europe and between Europe and the other great civilizations of the Eurasian land mass. Transfer of technology is the handmaiden of trade. The Silk Road was an avenue along which ideas – the most mobile form of capital – made their way from West to East, from East to West. Indian-Arabic numerals made their way to Spain because Islamic thinkers published books using them, Christian scholars discovering their power. Printing was originally developed in China. Silk reeling started in China, spreading throughout the Islamic region, making its way into Italy. So it is with the manufacture of gunpowder that was pioneered by Chinese alchemists.

As with Islamic advances in credit creation and the freeing up of capital to move across time and space so it was with gunpowder. Once Europeans discovered innovations made elsewhere on the Eurasian land mass, they ran with them. It was not the Islamic caliphate; it was not Saladin; though Chinese artisans experimented with gunpowder using bombards it was not a Chinese general that extended a technique for processing of saltpeter, creating a potent
shell that could be readily fired by a gun or cannon, a potent shell that would eventually be
mass produced. It was Europeans who did this.

Why one asks? Because Europe was subject to the political pendulum swing,
fragmented into feudal estates that warred with one another, divided into loosely confederated
kingdoms that tried to get an upper hand over one another. Warfare was endemic to Europe.
Driving down the price of exerting military force ($p_{mf}$) was at a premium in Europe. Bringing
gunpowder into regular use in warfare had massive consequences, comparable to the way the
chariot, the stirrup, the saddle, the crossbow transformed combat in the past.

From the late fourteenth century on Europeans had to drink from a chalice poisoned by
gunpowder. The most important consequence was the gradual demise of feudal knighthood.
Use of armed infantry – including employment of semi-skilled mercenaries – gradually
displaced use of armed knights riding into combat. As this happened the door was open for the
emergence of powerful states. In particular in England – blessed by being an island nation
difficult to invade – and in France gradually emerged powerful kings that exploited statecraft in
asserting their power over feudal lords. Once the Netherlands extracted themselves from
Spanish rule they joined the ranks of states in this case as a republic ruled by an oligarchy. In
marked contrast the Holy Roman Empire remained hopelessly fragmented.

Not surprisingly where merchants had achieved the greatest gains in status, where the
promotion of banking and joint-stock financing had made the greatest inroads on the economy,
where urbanization had taken off with unusual force, Protestant religion had the strongest
appeal. This was the case in both England and the Netherlands. By contrast France emerged as
a strong state primarily on the strength of its rural sector, its farming. To be sure, productivity
gains in agriculture occurred in all three countries as open field feudal use of land gave way to
enclosed farms experimenting with new crop rotations.

However the benefits flowing from productivity advance in farming were not the same
in all three of the emerging states, England, France and the Netherlands. In the countries
leaning toward Protestantism productivity gains increased the surplus a typical farmer could
produce – a surplus above and beyond what the farmer needed to live on – setting in motion a
move of rural dwellers to the cities where the surpluses racked up by agriculture could be
consumed. Likewise many farmers began producing handicrafts and inputs into manufacturing
– originally controlled by artisan guilds – employing time of family members freed up from
planting and harvesting obligations to engage in non-agriculture activities, increasing the
intensity at which they toiled by working longer hours and putting greater thought into how to
make each of these hours more productive.\textsuperscript{56} In France farming tended to hang on much longer
at the expense of commercial expansion. What was the chicken and what was the egg? Did
leaning toward Protestantism encourage the embrace of commerce? Or did the embrace of
merchant capitalism plant the seeds of a strong commitment to Protestantism, to inculcating
belief in the accusation that the pope was the anti-Christ, and that priests were corrupt,
avaricious perhaps demented?

\textit{Part III: Technological Capitalism and the Pendulum Swing}

\textit{The Pendulum Swing in Political Economy: Mercantilism versus Fragmentation}
By the term “technological capitalism” I mean investment in technological progress funded by credit creation. Inherent in technological progress is the spawning of new ideas, fresh skills, and the employment of fixed capital embodied in machines, structures and transport equipment.

Grasping concepts - learning how to use blueprints for the organization and implementation of production - is the most important component of technological capitalism. Concepts, the memes of intellectual capital are inherently mobile. They can be taught through many channels: masters convey ideas to apprentices in guilds; managers instruct shop floor workers in factories; books describe blueprints in exhausting detail; schools offer instruction in the concepts in a classroom setting. The potential for diffusion, leakage from organizations or individuals attempting to monopolize them, is extremely high.

Reflecting this reality - much of the capital inherent in technological capitalism taking the form of highly mobile capital almost impossible to keep bottled up – a strong disincentive to undertaking the costly investment in coming up with new technologies can stymie technological capitalism. One way around this problem is creating a positive feedback cycle, progress feeding on progress, invention fostering invention. Say a first step is taken by agent A. Suppose A knows that agents B, C, and D will utilize the first step without incurring the costs of innovation that were incurred by A – a disincentive from bearing the costs to be sure – but also expects that B, C and D will make improvements on the step taken by A (by carrying out their own costly product development) ultimately benefiting A in the long-run. In short suppose expectation of
unending progress saturates the community. In this environment technological progress can flourish.

The paradigm case of positive feedback – the one that emerged in Europe after the Crusades – is one in which technological improvements fostering gains in scientific knowledge that in turn laid the groundwork for improvements in technology. Key to the spawning of this positive feedback cycle is the fact that the rewards attractive to shop floor inventors are different from the rewards appealing to scientists. Scientists seek prestige, status within the community of their peers. Often prestige translates into riches: a boast in salary, support for travel to give learned lectures, control over laboratories. At a minimum, power and influence act as a motivator. To be sure some are less selfish, enjoying the thrill of discovery for discovery sake. In any event the typical priority a scientist works with is to making knowledge public. Believing constant criticism and debate stimulates further gains in scientific knowledge most agents working within the scientific community possess a compelling incentive to spread new discoveries far and wide.

Typically an inventor/innovator wants something else: material rewards, amassing resources for financing further invention. Finding a way to reap a long stream of financial benefits from their work naturally leads them to want secrecy, or at in the absence of secrecy a mechanism from profiting from what they have accomplished.

Creating an institutional environment in which both communities – innovators and scientists – can benefit one another means creating a community in which expectations of progress flourishes. This is the essence of technological capitalism.
Technological capitalism emerged in Europe during the sixteenth, seventeenth and eighteenth centuries. It thrived in Europe on the basis of a political and material pendulum swing pitting mercantilist states against economic fragmentation, local monopolies extracting rents in cities and market towns. It thrived in Europe because mercantilist states actively opposed each other in military and economic affairs, thereby inducing technological progress. It thrived in Europe because competition between radically different scientific ideas set in motion a pendulum swing in the intellectual field. Finally it thrived in Europe because a key element in technological progress involved precision, namely the exact measurement of time, distance, acceleration, mass, temperature, the nature of the microscopic world and the nature of the cosmos.

Mercantilism was the upshot of military competition between the emerging states of Europe. Those state rulers best equipped to extract resources for financing the military sub-economy were those that could best survive and prosper in a dog-eat-dog struggle for revenue from international trade and revenue from the domestic economy. Taking three major steps was crucial: transferring rents secured by local units – feudal estates, guilds, monasteries – from the local authorities to the national government, into the coffers of the monarch; increasing the efficiency of all economic actors by eliminating barriers to internal trade and commerce (e.g.: tolls on rivers, bridges, and short roads); and using trade policy to generate a surplus, thereby bringing in precious metals from abroad.

In terms of the military power equation the idea is to increase m (by increasing the share of rents in the economy taken in by the monarch) and increase Y by eliminating
inefficiencies and expanding commerce abroad, outside of the domestic arena. Embracing credit creating mobile capital was just the ticket.\textsuperscript{57} Not only did it give a fillip to foreign trade and international commerce; as well it promoted domestic investment by merchants in rural areas undercutting the power of urban guilds monopolizing local markets.\textsuperscript{58}

Undergirding all of this was technological competition. There were two reasons why this was true, both involving the zero-sum logic of predation. By reducing the costs of fielding troops and naval forces – taking advantage of improvements in ship construction, ballistics and the lethality of weaponry - military capacity was enhanced. By attracting trade and economic activity away from potential rivals states bolstered the size of the pie from which they extracted taxes and rents.

War is costly: the bigger the economy the easier it is to secure the wherewithal to carry it on successfully. How do you encourage exports, discouraging imports, bolstering your bottom line? Promoting novelties, niche products, that competitors do not know how to make is one approach. Improving quality, avoiding acquiring a reputation for shoddy output is another. The deeper the cornucopia of techniques you can draw upon, the more likely it is that you can come up with winners. To be sure what is in the interest of the state focusing on the average quality engendered in the aggregate economy is not necessarily in the interests of local producers – weaving guilds in Liverpool or Lyons for instance – who may prefer exploiting regionally protected monopoly rents. This is why mercantilist policy makers worked assiduously to destroy local monopolies, to encourage competition within their entire jurisdiction, to ramp up the scale of monopoly to the state level. Granting a state level monopoly was an excellent way to
transfer rents from localities to monarchs. Encouraging the success of state level monopolies by underwriting research and development in technology naturally went hand in hand with this strategy.

Not surprisingly opposing the drive toward mercantilism were institutions extracting rents from local markets. The guilds are a prominent example.

The guild – both merchant or craft guild – originated in an environment in which purifying commerce and manufacture was crucial to the survival of institutions in a world colored by the Christian concept of purgatory. Guild membership helped addressed these concerns. Guilds were both religious and commercial organizations. They adopted as guild names referenced to patron saints or specific Christian events. For instance in the English census of 1388 craft guilds dedicated to the Blessed Virgin Mary, Corpus Christi, Saint Nicholas, Saint Katherine, Saint John the Baptist, Saint William, Saint Lawrence, and All Saint appear. 59

As religious institutions they attended funerals and dirges for deceased members, placed burning candles in churches, paid priests to perform functions, and gave alms. They paid for masses dedicated to the souls of deceased members with the aim of limiting the suffering of the deceased member in purgatory. At the same time they advertised their membership as good Christians, following the commandments, eschewing the seven deadly sins, being truthful, avoiding theft. Lest they be thought of as corrupt and deceitful, they committed themselves to producing high quality goods and selling them at fair prices. Having the right to inspect the operations of all guild members, they claimed to prevent the manufacture and dispensing of shoddy goods. In short bundling together piety and profit had two important consequences. It
discouraged members from violating manufacturing standards by raising the cost of being dismissed from the rolls of the guild or voluntary abandoning the guild, taking guild secrets upon exiting for greener pastures. As long as one remained a guild member one could reasonably expect to have alms given, masses held, and prayers organized, by ones colleagues upon ones death went one presumably moved onto purgatory. Moreover, as quasi-religious organizations, guilds advertised the commitment of their members to purity in commercial dealings.

Guilds functioned as cartels. In so far as they combined piety with profit they exercised tight – oppressive it could be argued – control over their members. The cost of being driven out of the ranks of the guild being high, most members toed the line. The fact that guild members tended to cluster in a district made it easy to monitor one’s colleagues. No wonder guilds were sometimes attacked as monopolies: a cartel in which cheating is absent functions as monopoly. As a result the more perfect the cartel, the closer it could act as a monopolist – and a single buyer of labor in its region – the better it could extract rents.

Thus guilds played a crucial role in conditioning European labor and product markets. Under the rules of the guilds masters who owned their own shops could take on a limited number of apprentices who were contracted out to the master. In principle the master taught the apprentice skills, thereby augmenting the human capital of the apprentice. Masters charged fees to compensate them for their efforts. As well masters benefited from the labor services of the apprentices. Upon completing their apprenticeships the apprentice became a journeyman, often tramping around through a network of towns and rural communities in searching for
work. The lucky journeymen became masters enjoying the full rights of membership. Following this logic Epstein (1988) argues that guilds played a key role in improving the quality of human capital throughout Europe between the twelfth and the eighteenth centuries. As well he argues that the circulating of journeymen gave a fillip to the diffusion of best practice technique within fields like hide tanning, iron working, silk reeling, wool weaving, tailoring, tiling, even clerking or tax farming.

It is important to separate out labor training from technical innovation and diffusion of best practice technique. To be sure some skills were passed on by masters to their apprentices. But – and this is a big “but” – was the master equipped to teach? Moreover was the master willing to give up all of his secrets and clever time saving practices to an apprentice who was likely to become a competitor? More to the point, viewing the transmission of innovations from a selfish angle, did a guild of wool spinners in London that innovated within a field want to see its technological advances mimicked by a wool spinning guild in Antwerp? If the whole point of the guild exercise was to offer beneficial goods and services to the community it served – goods and services superior and better priced than those that could be imported by merchants from elsewhere - did it not have an overriding incentive to monopolize guild secrets?

In actual practice – as opposed to Christian posturing – guilds practiced rent seeking, hardly surprising in a regime in which the secular clergy and the monasteries were also capturing rents. Apprentices were exploited, cheated by masters who refused to reveal trade secrets. Mercers and wool sellers raised prices for their wares when were shortages appeared in the marketplace. Guilds held onto trade secrets as long as they could. 62 Jaundiced
journeymen organized their own associations, attacking guild elites, attempting to exploit any special techniques they had gleaned from observing their masters.

Beginning during in the late medieval period, three institutions attempted to counter the stranglehold guilds had over markets: state sponsorship of science and technology; private patronage; and patents. The fact that they took the form they did reflects the political fragmentation of European and the desire of strong monarchs to counter that fragmentation, pushing the pendulum away from localness toward strong state consolidation.

Appreciating the problems imposed on communities by craft guild rules in late medieval Europe, astute individuals and opportunistic organizations interested in promoting technological innovation lobbied for alternatives to guilds. Not surprisingly merchant guilds that often managed to gain political control over European jurisdictions were important players. After all their enterprises benefitted if the prices they paid craft guild suppliers for the goods they exported to other communities were lowered through technological improvements that increased labor productivity. Not surprisingly governments - whether city, ecclesiastical township, princedom, duchy, or monarchical state - offered prizes and subsidies to innovators.

To be sure government investment in technical research predates has a long history predating its flourishing in the late medieval era. Driven by astrological concerns, monarchs and Emperors maintained observatories to chart the stars. Royal mints experimented with metals alloys. What late medieval and early modern Europe brought to the table was a remarkable profusion of quasi-governmental institutions subsidizing research: Royal Societies
armed with grants; university grants; royal promises of lifetime pensions for successful inventors; cross-fertilization yoking together guilds, learned societies and city administrations.

Government and university subsidy was especially important for innovation in precision instrument production. While some of the advances made were mainly applied to empirical philosophy in the first instance – scientific observation – some were generated by commercial endeavor, mainly on the high seas, and all of them eventually had practical application. Navigation, surveying, medical practice, the construction of steam engines, the manufacture of field weapons all benefited from the telescopes, microscopes, air pumps, pendulum clocks, and refined balances.

The case of European oceanic exploration illustrates the general phenomenon. It was one important driver for the explosion of investment particularly by governments. Reflecting the intense competition between the emerging states of Europe the push to improve navigation aids went hand in hand with burgeoning demand for devices that sailors could use to accurately observe activity on potentially hostile ships. Henry the Navigator assembled a group of mathematicians and navigation experts with the aim of improving the astrolabe thereby enhancing the capacity of the Portuguese fleet to explore the coast of Africa and the islands off its western shoreline. As a result the mariner astrolabe came into being. Galileo originally developed the telescope with the aim of marketing it to Venetian merchant houses who wanted to improve their ability to observe the goods and personnel aboard rival ships. Colbert, French Minister of Finance commissioned Christiaan Huygens to invent a marine chronometer for accurately measuring longitude at sea during the 1670s. Ultimately a prize offered by the
British government in the early 1700s yielded a successful device. John Harrison, a Yorkshire carpenter turned clockmaker earned a £20,000 reward for his successful submission.

Finally there was the patent.

Sometime in the late medieval period – in the fourteenth and fifteenth centuries – European monarchs, smaller governments and cities alike began issuing patents. Monopolies of a sort insofar as their recipient enjoyed exclusive rights over a production technique or the manufacture of a specific product for a limited duration, say ten years. It is said that English kings promulgated royal grants of patent to foreigners with the express aim of encourage them to immigrate to England. It is said the Italian republics granted patents for the making of glass and the construction of barges with sophisticated gearing. Trivellato (2008: 222) notes that the Venetian Senate issued at least 1,900 patents of invention between 1474 and 1788. Once Italians became familiar with the patenting institution they exploited its potential for blackmail: grant a patent to me and my colleagues or we will go elsewhere, securing an exclusive manufacturing opportunity in another realm. Late medieval Europe, still highly fragmented, was the perfect soil upon which the patent system could set down roots.64

Securing a reputation for refining materials – smoothing the surface of glass, perfecting the balances used by assayers – was good advertising. As well securing patents was good advertising. For the artisan and his or her shop the award of a patent typically sent out a market signal: the recipient took precision seriously. Market opportunities were proliferating. Rich patrons sought beautifully made devices. As commerce began to flourish in the aftermath of the Crusades, enjoying the taste to differentiate the tasteful from the crass became a sign of
refinement amongst elites. Monarchs, dukes, princes, wealthy burghers were certainly interested in possessing beautifully made trinkets that they could shower on guests as gifts; that they could employ in attracting politically influential spouses, essential for monarchical diplomacy. Ironically monarchical diplomacy managed through marriage alliances had been widely practiced by the comitatus following the logic of treaty making on the steppes of Central Asia by trading brides along with material riches.

One wonders: what made European manufacturing so special that patents would become spread across jurisdictions in a pre-industrial world? The answer is simple: some European artisans were keen to perfect what purchasers could obtain from their private establishments. They wished to operate outside of guilds. They were unable to secure patronage. Their university posts generated earnings insufficient to fund their research activities. They wanted to build up their own laboratories. In all of this the demand for precision was present.

A central mission of mercantilist planners was to scale up the size of the economic base on which rents could be extracted. Encouraging the creation of a global East India Company, a Royal African Company, a Hudson Bay Company, or a Dutch VOC allowed national authorities to extract rents. Monasteries, feudal lords and guilds had done this in past. Now states in the business of selling charters to globally oriented merchant enterprises were aggrandizing the rents. As well they enjoyed the side benefit that the arming of the mercantilist merchant companies brought to the table.
All of this was in the service of state military potential, that is, in the service of national power and national status. Four hundred years after Europe struggled with military fragmentation in its futile attempt to wrest the Holy Land away from Islamic rule, the centralized mercantilist system – ideologically committed to wiping out the vestiges of feudalism – profoundly transformed the political nature of the military power equation.

Mercantilism was the highest form of merchant capitalism, far overshadowing the small scale merchant businesses that flourished under Islamic rule.

How important was Europe’s merchant capitalism to the emergence of modern capitalism as it evolved later on with the first industrial revolution of the 18th century and the second industrial revolution of the nineteenth century?

According to Marx’s classic work *Capital* a lot:\(^6\)

“The circulation of commodities is the starting point of capital. The production of commodities, their circulation, and that more developed form of their circulation called commerce, these form the historical groundwork from which it rises. The modern history of capital dates from the creation in the 16th century of a world-embracing commerce and a world embracing market.”

and:

“The discovery of gold and silver in America, the extirpation, enslavement and entombment in mines of the aboriginal population, the beginning of the conquest and looting of the East Indies, the turning of Africa into a warren for the commercial hunting of black-skins, signalised the rosy dawn of capitalist production. These idyllic proceedings are the chief momenta of primitive accumulation. On their heels treads the commercial war of the European nations, with the globe for a theatre. It begins with the revolt of the Netherlands from Spain, assumes giant dimensions in England’s anti-jacobin war, and is still going on in the opium wars against China...”

For Marx capitalism went hand in hand with predation.
The so-called European scientific revolution of the sixteenth and seventeenth centuries drew upon progress in precision measurement – a material phenomenon – that was wedded to progress arising out of ideological disputes. Both types of progress moved in tandem.

Pendulum swings between opposing positions were active in both arenas.

Consider the importance of precision first. Begin with a tantalizing question: why did alchemy run into dead ends in China, India, and the Islamic world yet blossomed into ch

chemistry in Western Europe? The answer lies in the technology of precision instrument making. As Leicester (1965: 82 ff) points out the reason alchemy morphed into the experimental field of chemistry was the command over precision reached by European artisans. In the mundane field of material craftsmanship Europeans had gone far down the road of experience. They were adept at making glass freed of mineral impurities that could and did contaminate chemical mixtures. They were well versed in creating accurate balances and scales used by assayers and alchemists alike. Accurately weighing outputs from alchemical experiments created a body of quantitative knowledge that experimenters of all backgrounds, including wealthy amateurs, could tap into. Materialist technology drove the ideas of science as it has for most of human history, at least up until the mid-nineteenth century when technology gradually became applied science. In the transition from technological driven science to scientifically driven technology the first industrial revolution represents a remarkable phase when advances in the fields of
thought and material experimentation, spawning efficient steam engines and the theory of thermodynamics almost simultaneously.

It was the on-going use of exacting measurement that permitted alchemists to shed the mysticism of alchemy. Through repeated experiments - in which elements were decomposed into their constituent parts that were then employed in reversing the process, the various parts being reassembled into the original element in the laboratory - chemistry as an academic field emerged. As Klein and Lefèvre (2007) point out this program, extended throughout the eighteenth century, yielded the monumental table of chemical nomenclature painstakingly put together and published jointly by Lavoisier and his colleagues in 1787. Behind this massive project were years of advance in material science gradually creating a consensus around the theory of chemical affinity. In their view Lavoisier was more the heir than the instigator of a new version of chemistry.

Holders of professorships in mathematics, mechanics, astronomy - natural and experimental philosophers specializing in science – devised most of the precision instruments whose applications in the fields of surveying, optics, fluid and gas mechanics established a foundation upon which the English industrial revolution rested.

For instance Edmund Gunter professor of astronomy at Gresham College invented a one hundred link chain for surveying. With this device the costs of accurately laying out the dimensions of private plots and private toll ways fell. It made it easier to specify the cheapest paths for road beds and the optimal placing of bridges spanning rivers and tunnels cutting through mountains. In short it was just one of the many specialized technical instruments –
joining telescopes, backstaffs, sextants, and the like – making for improvements in transport infrastructure (surveying) that reduced the costs of moving goods and people.

In the fields of measuring pressure professorial research was in the forefront. Daniel Bernoulli, Professor at the University of Basil, invented a device to measure blood pressure. Robert Boyle, wealthy Anglo-Irishman and patron of the “invisible college” in London that eventually morphed into the Royal Society of London for Improving Natural Knowledge, extensively experimented with air pumps, eventually showing that the volume of gas varies inversely with its pressure. His protégé, Robert Hooke, worked as an assistant to Boyle, eventually become the curator of experiments for the Royal Society, earning an annual gratuity that allowed him to carry on his research. Interestingly he corresponded with Thomas Newcomen regarding the construction of a steam pump that could be used in pumping out mine shafts. Hooke suggesting creating a vacuum through condensation of steam might be effective.

Research in optics – the work of Isaac Newton, Lucasian Professor of Mathematics at the University of Cambridge, carried out the late seventeenth century stands out – had important spinoffs in practical fields. To be sure in the short run applications to the manufacture of telescopes and microscopes were mainly limited to the practice of science itself. However spectacle makers also benefited from the demands that science placed on lens grinders. Mass production of spectacles had huge pay-offs: it extended the economically productive life of artisans, clerks, merchants and seamen.
National governments, universities, and monarch supported institutions like the Royal Society were not the only public or semi-public institutions dispensing grants and prizes for innovation. Pérez (2008) shows that the eighteenth century government of Lyon was actively involved in encouraging invention in silk manufacturing: 170 of the nearly 900 inventors who applied to the French national administration for a privilege of invention or a reward came from artisans in the city. In the case of Lyon the major guild in silk production, the Grande Fabrique, worked hand in glove with city administrators, the national government and merchants in coming up with grants and prizes rewarding innovators.

Outside the world of institutions was the private patron, the wealthy merchant, the duke, the prince, the gentleman scientist. Turner (1990) provides many examples of the purchase of precision instruments devised by wealthy individuals executed by master craftsmen. Some of these individuals became private patrons for scientists; some gave grants to learned societies like the Royal Society in London. Hooke was the beneficiary of an annuity funded by a patron. Early in his career Francis Bacon, advocate of public funding for practical advances in science and engineering, benefited from the patronage of Lord Essex. The Gentlemen’s Magazine of the late seventeenth and eighteenth centuries carried advertisements for philosophical instruments. People of means purchased their own cabinets containing microscopes, measuring devices, and telescopes. The fourth Earl of Cork and Orrery became the patron of John Rowley. Rowley was a gifted instrument maker. At the Duke’s request he copied the work of George Graham, a highly respected member of the Royal Society who worked on devising the Greenwich Observatory, creating a model of the Copernican system that
mechanically demonstrated the movement of the known planets. Known as an orrery, the model became a veritable splash in elite circles: Queen Anne commissioned one that she gave to Prince Eugene of Savoy; brass and steel versions resting in expensive mahogany cases were snapped up by the wealthy; cheaper knock-offs flooded the market.

It is difficult to pinpoint when and why the European fascination with precise measurement started. One likely contender is the measurement of time.

How much Christianity had to do with a European fascination with precise measurement of time is an interesting question. Landes (1983: 58 ff) argues that it does. Landes points out that pious Jews pray three times a day, but not at set times. Similar is Islam: five prayer times are deemed crucial but they are set by a natural clock (dawn, right before noon, before sunset, after sunset and after dark). Without any natural guidelines as to prayer monks were inclined to pray all the time. Presumably praying continually was a sign of devotion; those not showing such devotion were viewed as laggards by their colleagues. To free up time for work in the fields and for the copying of manuscripts something had to be done. Tertullian recommended prayer at set times: at the third, sixth, ninth hours. The Benedictine rule adopted this model, paving the way for its acceptance by other monastic orders. Hence a strong interest in developing mechanical timepieces that could be readily reproduced for use in far flung rural locales – unlike massive water clocks favored by Chinese emperors – that could be employed by bell ringers laboring in Church towers or belfries.

In short the monastery played an important role in pushing forward Western technology.

Outside of creating a demand for time pieces other potential links between monasticism and
technology have been suggested. One lies in the field of glass manufacturing. Churches and monasteries alike required elegant glass, especially so in the late medieval period when the great Gothic cathedrals with their beautiful stained glass illustrating scenes from the Holy Scriptures were under construction. Another possible link: managing gravity water systems. Magnusson (2001) makes a strong case for the view that the monastic orders demanded fresh clean water flowing out of taps at fountain heads. The result was a demand for pipes both bronze and wooden, holding tanks, elaborate pressure releasing cisterns and the like. Since the monastic orders were centralized, innovations obtained at one monastic site tended to spread rapidly to other locales through the agency of the order.

In any event the upshot of the monastic management of time was immense: by the late medieval period a stream of innovations in time measurement were available on the European market. Chamber clocks, timepieces, all types of mechanical clocks competed for funds of discriminating elites. By the fifteenth century spring driven clocks; and by the early sixteenth century miniature watches were being manufactured by skilled artisans. It is instructive that seventh century scientists like Galileo and Huygens invented pendulum clocks with the aim of making time measurement increasingly precise. Indeed natural philosophers like Galileo worked together with craftsmen in perfecting scientific instruments: geometric compasses, hydrostatic balances, and most famously telescopes.

Remarkably in fifteenth century manuscripts the Cardinal Virtue Temperance is depicted as wearing a clock on her head and eyeglasses in her right hand. She stands on a windmill. Precise instruments abound in this concept: miniature gears finely manufactured to
measure time; lens ground the better to see; massive gears converting wind power into a vehicle for grinding grain. Seeing clearly; being punctual; employing machines extracting power out of nature, manipulating nature. Representing this as virtue incarnate is making sacred a secular fascination with mechanical precision.

In sum, in the late medieval and early modern periods the European supply of precision instruments vigorously expanded. Whether guilds hindered this growth or harnessed it is a matter of considerable debate.\textsuperscript{70} In any event outside the guild institution were other sources of supply: work funding by governments, learned societies, universities and their laboratories, private patrons, and patents. Over time the guilds became less influential. The Reformation eroded belief in purgatory weakening the power of piety an essential glue of the guild; the Inquisition promoted by the Counter Reformation stifled creativity in the guilds located in Catholic lands.\textsuperscript{71} The spread of great cities like London spawned suburbs where artisans could escape the control exercised by the powerful guilds assembled under the umbrella of the London Livery Companies. Incipient industrialization creating new metropolises free of guild control; all of this meant that the patent, universities and government loomed larger and larger in the supplying of precision manufactures. Finally governments of freshly minted nation-state intent on weakening local sources of influence and power that could challenge their authority legally abolished the guilds. Patents, universities and government became the hallmarks of incipient technological capitalism.

Patents, universities, government are institutions. Ideas are generated through and by them because they compete for resources, supporting the individuals and groups who generate
the ideas. In turn competition in the world of ideas determines how the institutions reach
decisions about what individuals should receive funding. The pendulum swings in the field of
natural philosophy during seventeenth century illustrate these principles with a vengeance. The
story begins with the struggle between scholasticism and natural philosophy.72

Natural philosophy as a method of thought went hand in hand with humanism.
Humanists thought Greek and Roman philosophy had reached the pinnacle of human thought
but that did not mean slavish adherence to Aristotle. In 1417 the poem of Lucretius On the
Nature of Things was rediscovered by humanists.73 The lure of atomism had returned. Combine
atomism with the clock, a mechanical device regulating the flow of time. You have the essence
of natural philosophy: you can imagine a mechanical universe – one following mathematic laws
of physics – that can be ultimately explained in atomic terms. In succeeding with this agenda
the shadowy clouds of Aristotle and scholasticism were finally cleared away. Not surprisingly
this drove a wedge between the Catholic Church and natural philosophy. However – and quite
surprisingly – it did not drive a wedge between religion and science. This wedge was not
decisively driven in until the nineteenth century.

The attack upon Aristotle was not the first major step in demolishing scholasticism.
Remarkably the first step was taken by a Catholic cleric living in Cracow: Copernicus. An
accomplished student of mathematics (astronomy and mathematics were conjoined in
medieval thought), Copernicus took on a project assigned by Rome: reform the calendar so a
definite date for Easter can be determined. Principally relying on observations made by ancient
astrologers (Timocharis, Hipparchus, Ptolemy) and their Islamic successors (Arzachel, al-Battani)
– he himself made only a few independent observations on his account - Copernicus followed
rigorous mathematical logic in working out a heliocentric theory of planetary motion. In doing
so he incorporated epicycles to explain contrary motions carved out along circular orbits just as
Ptolemy had done centuries before. However his theory required fewer epicycles, a clear
victory for aesthetically pleasing simplicity. In doing so he rejected the thesis of a geocentric
universe held by both by Aristotle and Ptolemy. \(^{74}\) As it turned out the idea of a heliocentric
theory of the universe was even known to Greek philosophy. It just was not the mainstream
view. The original contribution made by Copernicus was pointing out that while both
heliocentric and geocentric theories were consistent with the observations made by star gazers,
the mathematics was cleaner under the heliocentric model. As well Copernicus felt his theory
was superior for the purposes of creating an accurate calendar. It was on this basis that he
consulted with Pope Clement VII in 1533 regarding his theory.

It is important to keep in mind that Copernicus did not attack Aristotelian principles of
physics. He was astrologer cum mathematician. It was Galileo who went after Aristotelian
physics with a vengeance. His attack began with the problem of acceleration and de-
acceleration. It was well known to scholastic philosophers – notably Oresme – that Aristotle’s
theory of an active medium (air or water) causing motion of bodies was inconsistent with
change in motion. Indeed these philosophers modified Aristotle’s theory, arguing the speed of
motion explained by Aristotle only applied to the average speed over the space traversed,
faster at the outset, slower at the end. As well the philosophers had come to reject the notion
that the speed of a falling body is proportional to its weight, a view maintained by Aristotle. \(^{75}\)
To be sure observation must have had something to do with their conclusions, but it is likely the main thrust of their reasoning was logic itself.

Galileo, however, did experiments from which he arrived at conclusions concerning the speed and acceleration of falling bodies. Having done these experiments he came up with a simple mathematical expression for speed, namely speed is equal to one half of the product of acceleration multiplied by the square of time. In short he attacked Aristotelian principles on both mathematical and experimental grounds. He crossed a huge intellectual chasm by proposing a simple mechanical law of inertia, throwing away as secondary concerns about friction and resistance inherent to media like air and water. Of course the next step is to remove the resistance of air by creating a vacuum devoid of resistance. Aristotle had claimed nature abhorred a vacuum. But Aristotle was wrong about motion. Why believe in his theory of a vacuum?

Galileo was not only a natural philosopher of genius, mixing mathematical logic with observation. He was also an ideologist, a harsh critic of scholasticism and of Aristotle in particular. Not surprisingly he was impressed with the theory Copernicus. That he turned his telescope to the heavens – years after he used it to show Italian merchants that they could employ it for commercial purposes, gathering information regarding the makeup of approaching ships at a distance – discovering new satellites orbiting around Saturn (that he named the Medician stars after the Medici family which had supported his ventures), discovering spots on the sun, discovering that the moon had a rocky surface, only added fuel to his ideological fire. The telescope seemed to prove was that Aristotle’s notion of a pure celestial
realm was nonsense. But Galileo was already convinced Aristotle’s theory was shot full with errors. Galileo was no alchemist but in company with the alchemists he was bent of demolishing scholasticism lock stock and barrel. It is for this reason that he ran afoul of the papal inquisition. After all Thomas Aquinas had been canonized a saint and his synthesis of Aristotelian thought with Catholic faith was widely respected by the Vatican. In his polemical *Dialogue Concerning the Two World Systems* published in 1632 a feisty Galileo, ignoring the politics of the church, lampooned a naïve medieval Aristotelian he named Simplicio, who was revealed a fool in his debate against a rival natural philosopher. Tried by an inquisitional court Galileo was placed under house arrest, still ending his life in comparative luxury. His treatment at the hands of the clerics sent a message around cultivated thinkers throughout Europe. How far can one go in confronting the Roman church? It might be argued that the spread of Protestantism rendered free thinking more acceptable. Not so. Luther railed against Copernicus. In point of fact because the early Protestant sects were absorbed imbibing the gospel of Jesus they were inclined to dismiss the philosophical god of scholasticism as well as anything that threatened their belief in miracles.

In this pugnacious attitude toward scholasticism Galileo reminds us of Paracelsus. Indeed in venerating the common knowledge of engineers and artisans Galileo does fit into the hermetic tradition. Nor was he unique among the great thinkers of natural philosophy. Francis Bacon, the so-called architect of empiricism was an avid supporter of hermetic knowledge, a dedicated occultist. His agenda was wedding the practical knowledge of artisans and alchemists to the interests of the state. He was mercantilist to the core. Ironically hermetic methods and
beliefs proved anathema to the younger generation of natural philosophers touting the importance of careful experiment. Boyle is a case in point. An atomist and a devout Anglican he carried out countless chemical experiments, working with an air pump to create vacuums and test theories about the relationship of gas pressure and volume. In laying down an experimental agenda that did not dabble in mysterious forces he and his colleagues at the Royal Society of London for Improving Natural Knowledge laid the foundation of an experiment oriented philosophy devoid to the superstitions of alchemy.

Raised by Jesuits and mindful of Galileo’s fate, Descartes took a different path from Galileo in his approach to demolishing the veneration of Aristotle. Rather than simply attack the ancient philosopher as Galileo did, Descartes did him one better. Descartes attempted to replace Aristotle. Taking on the mantle of a new Aristotle, reasoning from first principles, deriving conclusions consistent with the state of art in experiment and observation, he aspired to a grand synthesis in which soul, mind and matter coexist in a grand mechanical harmony. Consistent with the principles of Descartes’s own analytical geometry matter consists of atoms extended into space. There is nothing between the atoms consisting of three types. No vacuum separates one from another. The atoms push one another; they form vortices in space accounting for the movements of comets in the celestial realm. The universe is completely mechanical devised by a rational God who designed it in accordance with physical laws. Non-human animal bodies are machines lacking souls. Human bodies are machines as well, differing from from lower animals by having an immortal soul, the pineal gland located in the brain.
Descartes never claimed to know exactly what the actual mechanical laws governing the mechanical operation of the universe are. He imagined a kind of wall of human knowledge. Many laws might be consistent with what humans observe, ferreting out these observations through precise experiments. God knows the laws precisely; mere mortal humans speculate on the nature of the laws based on their experimental observations. True we are mere humans but still we do know quite a bit. We know the universe is a machine operating very much like a clock. We know one God designed it. We know that once He designed it he did not have to intervene in its future operation. Like a clock it was wound up, running in accordance with the springs, gears and wheels that God created. That the universe is atomistic does not mean one should subscribe to atheism. Indeed the reverse is the case. The mechanical operation of an atomistic universe reveals the grandeur of God’s plan.

While Descartes was spinning out his mechanistic accounts of the solar system based on his theory of atoms pushing violently against each other generating huge whirlpools – vortices – in space empirical and theoretical advances in astronomy and astrology were undermining his approach altogether. Not surprisingly he ignored these advances. Not surprisingly his is arch-opponent Newton did not ignore these advances. As it turned out the new findings – captured in Kepler’s three laws of planetary motion – fit very nicely into Newton’s anti-Cartesian agenda. Unlike Descartes he imagined space is a void, masses residing in this void, pulled toward or away from each other by spiritual forces, occult principles in action. Newton’s atoms did not clash into each other. Rather they were bound together by force expressed at a distance. Gravity was such a force. Whether Newton actually observed an apple falling toward the center
of the earth or whether he simply imagined the idea of the center of an apple attracted toward the center of the earth really does not matter. What is clear is that he had a picture in his mind of how natural law operated, one that he could explain in terms of elegant mathematics.

What were the advances in astronomy that Newton felt lay sprawled across the entrance to a royal road revolutionizing the field of natural philosophy? These advances were both materialistic – telescopes, observatories – and idealistic, specifically mathematical, arguably Platonic. The most important figures were Galileo, Brahe and Kepler. The analysis proposed by Copernicus was based on crude observations, under ten minutes of arc in precision. With support from the Danish crown Brahe launched a massive data collecting project in a beautifully designed and fashionably equipped observatory on a Danish island lying off the coast. His naked eye observations were remarkable for the time. He reduced error in measurement to the point where theory could catch up with data. Brahe himself advanced a theory based on his wide ranging minutely observed records that combined Copernican theory with Ptolemaic theory. In his model the sun and moon orbited around the earth, the planets orbiting around the sun. A much derided speculation today, Brahe’s figures were precise enough to command respect for his system during the seventeenth century. That is, before Kepler used Brahe’s data to construct a more compelling model of the solar system.

Kepler was the one of – if not the first – the group of serious astronomers accepting Copernicus’s heliocentric model of the universe. He came to it through Platonic mysticism. In his *The Cosmographic Mystery* published in 1595 he argued the solar system was organized in Russian doll fashion. Five distinct Platonic solids were organized in a hierarchy – the innermost
seated closest to the sun at the center, the remainder placed one on top of another, each solid representing a path of motion for one of the known planets. The sun was the symbol of God the Father. Kepler was a committed Protestant, totally sincere in his Christian faith, trying as did Boyle to explain how a divinely inspired universe operated. In short, Kepler approached astronomy as a Platonic mathematician would.

That said, Kepler wanted to use the most precise data to further his speculations. It was with this in mind that he negotiated with Brahe the leading empirically oriented astronomer in Europe. He became Brahe’s assistant, appointed to the post with the aim of explaining the orbit of Mars, the planet exhibiting the most convoluted path in the Copernican scheme. Through subterfuge Kepler ultimately obtained Brahe’s full body of observations – Brahe was not interesting in sharing his treasure trove of observations with anyone else- after Brahe died. Kepler was now free to continue his mathematical investigations.

Equally committed to mathematical simplicity and to precise measurement – after all God designed the universe, leaving to mere humans traces of His divine plan in observable phenomena, the more precisely measured the better – Kepler kept tinkering with his analytical models until he finally arrived as his three famous laws of solar system mechanics. These are: (1) Elliptical orbits: the orbit of a planet is an ellipse – not a circle – with the sun as one of its two foci; (2) Equal intervals of area corresponding to equal intervals of time: a line stretching from the sun to any one planet sweeps out equal areas during equal intervals of time; and (3) Square/cube law: the square of the period of the orbit is proportional to the cube of its orbit axis. With the first of these three laws Kepler dispatched the belief in circular orbits, a holdover
from the ancient Greeks and Romans who believed in the purification of circles. With the second law Kepler came close to developing integral calculus. With the third law he provided a mathematical equation that – in the hands of an inspired mathematician like Newton – can be deduced from first principles, namely the idea of gravity.

Newton arose to the occasion, deducing all of Kepler’s laws from his theory of force, inertial mass, and acceleration (force equals mass multiplied by acceleration). That Newton was able to formulate a simple equation that not only explained Galileo’s experimental observations but also accounted for Kepler’s three laws is remarkable. It is certainly the crowning achievement of natural philosophy before it morphed into science during the eighteenth and nineteenth centuries. Surely this is one reason Newton’s reputation is clothed in heroic mystique: a god-like disinterested individual, dispassionately observing the mechanic operation of the cosmos, completely above the messiness of the intellectual pendulum swing.

Nonsense. From the outset it was Newton’s goal to discredit Cartesian thinking. He thought it was “vulgar,” pointing people down the path to atheism. In the classic experiment he himself carried out at a relatively early point in his career – in later years he employed an assistant John Cesaguliers to carry on experimental investigations – he set out to show sunlight was composed of a variety of colors, basing his reasoning on ancient harmonics exactly seven in number. Countering Descartes’ rival hypothesis that light appears colored because it passes through objects – for instance through a prism – Newton shined sunlight through a prism, breaking it up into separate colored beams that fall onto a screen. Drilling holes in the screen, Newton then experimented with the colored rays, allowing each to pass onto a separate prism
that passes the ray onto a second screen. Showing that the colored rays sent through a second set of prisms did not change color established proof that the colored rays are the actual basis - conjoined together - from which sunlight is assembled. Newton’s reasoning is that the colored rays are made up atoms held together by “active principles.” In short according to Newton Descartes’ entire theory of atomism is misguided. Atoms do not push against each other in the absence of an ether-like void. Rather atoms of a particular type are attracted to form rays because of the forces binding them to each other through the void. To a Cartesian Newton’s idea amounted to occultism. To Newton, who was an aficionado of hermetic alchemy, there was nothing wrong with occult forces. Indeed they were proof divine forces were active in the universe.

After Newton’s death his scientific followers – stimulated by Desaguliers who spread the Newtonian gospel through private schools and Newtonian centers, using the orrery to demonstrate how Kepler’s laws worked according to the gravitational logic of Newton – carried on investigations in an ever widening field of investigation. Using Newton’s equations anatomists explained how signals travel back and forth from the nerves to the brain through an ether-like fluid situated in the nerves. Using Newtonian logic Hume sought to build a psychology on experimental and mathematical foundations. So did Adam Smith. In fact Smith’s theory of moral sentiments is pretty much a carryover from Newton’s atomism. Individuals are social atoms bound together by altruistic forces. The fact that Smith developed a theory of how an economy could best function if individuals pursuing their own selfish interests (but connected to one another through altruism), buying and selling in price driven markets, that he
felt was Newtonian speaks volumes. It demonstrates why Newton himself a symbol of the British moderate enlightenment. Newtonian mechanical logic was fully consistent with individualism, an idea gaining increasing force in seventeenth century Britain (think John Locke). Moreover it did not threaten the Anglican faith. After all, Newton believed God actively intervened to keep his system operating. Without the deity’s guiding hand the solar system would collapse into itself due to the powerful gravitational forces at work.

Newton’s idea of an active deity clashed with the Cartesian idea of a divine architect winding up the clock of the universe, leaving it to operate according to the mechanical laws devised by the all-seeing perfect creator of the universe. According to Cartesians like Leibnitz Newton’s God was not perfect. Why would He invent a universe that it needed to fix on an ongoing basis? Both Newtonian and Cartesian theory led to deism, a belief in a universe guided by mathematical laws devised by an omniscient deity. Miracles did not really make sense in this world, a point Hume emphasized in his writing. In this sense both Cartesian and Newtonian schools completed a process set into motion by scholastics like Thomas Aquinas who made a clear distinction between faith – ultimate wisdom – and analytical philosophy designed to ferret out and explain phenomena discovered in physics and biology. Of course both Cartesian and Newtonian schools dispensed with Aristotle altogether.

In the pendulum swing set in motion by Newton, Newtonian and Cartesian philosophies were locked in a fierce competition that served as the capstone to natural philosophy at the beginning of the eighteenth century. Ultimately Newtonian principles defeated Cartesian logic. Why? One reason is its ability to explain Kepler’s laws. Another reason is the first industrial
revolution in England. Just as the mechanical clock was the symbol natural philosophy so the steam engine was the symbol of the first industrial revolution. Was it not designed along Newtonian principles? Well, not really. In fact it was not Newton that was important for the steam engine. It was Boyle - and the chemist Joseph Black, working with vacuum pumps, gas pressures and temperature gradients - who pioneered the way to the steam engine. Still Newton was a convenient symbol. And symbolized he was.

By way of summary it is useful to display a table capturing the pendulum swings back and forth between different competing schools of natural philosophy. Of course the main pendulum swing involved the swing away from scholasticism. By the end of the seventeenth century no serious natural philosophy subscribed to Aristotle. At a more general level no serious student of natural philosophy was comfortable basing their theories on what the Greek and Roman philosophers had actually written. To be sure Newton believed that there was lost ancient knowledge anticipating the discoveries of natural philosophy. In fact this was certainly a pipe dream. Still even Newton, alchemist and theologian, could not produce evidence that the ancients had revealed Kepler’s laws of planetary motion or developed the calculus.

In Table 2 I separate key figures of sixteenth and seventeenth century natural philosophy in two competing schools: persons specializing in observation and experiment, drawing upon the practical arts mastered by artisans, a school that owed much to alchemy and the Hermetic tradition; and persons mainly inspired by deductive mathematical reasoning. To oversimplify in making an analogy to ancient thought I call the first school materialist (think Aristotle emphasizing material factors, relying on observation albeit imperfect given the paucity
of measurement instruments), the second school idealist (think Pythagoras, Euclid and Plato). I want to emphasize that I concede that a number of the individuals listed in this table crossed boundaries, working in both materialist and idealist modes. Still I believe I am correctly emphasizing the main thrust of their contributions.
# Table 2: Key Figures in Two Competing Schools of Natural Philosophy

<table>
<thead>
<tr>
<th>Materialist</th>
<th>Comments</th>
<th>Idealist</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual, Key Works</strong></td>
<td></td>
<td><strong>Individual, Key Works</strong></td>
<td>Mathematician and astronomer, advocate of heliocentric theory of the universe</td>
</tr>
<tr>
<td>Copernicus (1473-1727)</td>
<td>De revolutionibus orbium coelestiam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galileo Galilei (1564-1642)</td>
<td>Telescope, pendulum, thermoscope, experiments on falling bodies, laws of acceleration and mechanical motion; condemned by inquisition, house arrest after 1634</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>The Assayer</em> (1623)</td>
<td><em>Dialogue Concerning the Two Chief World Systems</em> (1632)</td>
<td></td>
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<tr>
<td><em>The Assayer</em> (1623)</td>
<td><em>Dialogue Concerning the Two Chief World Systems</em> (1632)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tycho Brahe (1546-1609)</td>
<td>Last of major naked eye astronomers; great accuracy of observations</td>
<td>Johannes Kepler (1571-1630)</td>
<td>Inspired by Platonic theory of solids in early work; belief in sun as a symbol of God the Father; magnetic soul to the solar system</td>
</tr>
<tr>
<td><em>Introduction to the New Astronomy</em></td>
<td>In Tychonic system planets revolve around sun; sun and moon revolve around earth</td>
<td><em>The Cosmographic Mystery</em></td>
<td>Assistant to Brahe</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Epitome of Copernican Astronomy</em> (1617-1621)</td>
<td>Three laws of planetary motion</td>
</tr>
<tr>
<td>Francis Bacon (1561-1626)</td>
<td>Hermetic philosophy, interest in occult “Father of empiricism” Advocate of state support for developing practical knowledge as key to enhancing state power</td>
<td>René Descartes (1586-1650)</td>
<td>Atomist; mind-body dualism problem; developer of analytic geometry and theory of cubic equations</td>
</tr>
<tr>
<td><em>Novum Organum (New Method)</em> 1620</td>
<td><em>Discourse on Method</em> (1637)</td>
<td><em>Geometry</em> (1637)</td>
<td>Human body as a machine with a soul located in pineal gland</td>
</tr>
<tr>
<td><em>New Atlantis</em> (1627)</td>
<td><em>Description of the Human Body</em> (1648)</td>
<td></td>
<td>Deist</td>
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</table>
Table 2 [Continued]

<table>
<thead>
<tr>
<th>Materialist</th>
<th>Individual, Key Works</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Robert Boyle (1627-1691)</td>
<td>Alchemist and atomist; Anglican theologian and one of the founders of the Royal Society; director of East India Company Air pump; Boyle’s law of gases Advocate of careful experiments</td>
</tr>
<tr>
<td></td>
<td>The Sceptical Chymist (1661)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Isaac Newton (1643-1727)</td>
<td>Mathematician and natural philosopher developed calculus and model of mechanics combining Galileo’s acceleration principles with theory explaining Kepler’s results Believer in spiritual forces causing atoms to be pulled gravitationally to each other</td>
</tr>
<tr>
<td></td>
<td>Method of Fluxions (1671)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Philosophiae Naturalis Principia Mathematica (1687)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opticks (1704)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Idealist</th>
<th>Individual, Key Works</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gottfried Leibnitz (1636-1716)</td>
<td>Developer of calculus Sufficient reason; law of continuity; theory of nomads; best of all possible worlds Cartesian as opposed to Newtonian</td>
</tr>
<tr>
<td></td>
<td>“New method for maximums and minimums” (1684)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monadologie (1714)</td>
<td></td>
</tr>
</tbody>
</table>

The point of the table is to hammer home a theme running through the entire body of this paper. Over the long history of Western Europe pendulum swings were in continual motion. Beginning with the Greeks the process had continued in both material and intellectual realms. The pendulum swings of the heyday of natural philosophy are a perfect example. Commencing with the pendulum swing in which scholasticism was drubbed into submission by figures like Copernicus and particularly Galileo (heir to the hermetic tradition which mocked Aristotle) further pendulum swings were set into motion. Atomists like Boyle attacked hermetic
philosophers like Bacon. Careful experimenters like Boyle were skeptical of overarching theories like that of Descartes. Newton emerged as a pugnacious opponent of Cartesian thinking. In his death throes natural philosophy divided into two schools deeply divided over the nature of deism. Ironically God was soon knocked out of the picture altogether.

That God was knocked out of the picture was ultimately due to the political pendulum swing. The French Revolution took place in the late 18th century. One of its strongest tenets was anti-Catholicism. In its most violent phase – the terror of the mid-1790s- Rousseau-style philosophy was all inspiring to the radicals. Reason was the new god. Following the Protestants the state claimed assets and income streams once aggrandized by the church. The British Protestants had accomplished this task during the reigns of the Tudors and the Stuarts. Now it was France’s turn to disinvest the religious authorities. Secular authority was trumping religious authority. While the trend away from religious gift exchange was similar in both countries, a crucial difference between way secularization was ushered in Great Britain and in France is noteworthy. In Great Britain the Glorious Revolution that drove out Catholic leaning James II in 1688 set the stage for alternating two party – progressive Whigs versus conservative Tory - contested parliaments dominating over a monarchy much weakened by the political swings of the seventeenth century. This back and forth Whig versus Tory political logic moderated the British political swing. In France absolute monarchy wedded to strongly entrenched Catholic Church was overthrown by an increasing radicalized revolutionary movement. The pendulum swung much more violently in France. Indeed France quickly passed through virtually every
political form of degeneration mentioned by Aristotle, ultimately lead to dictatorial rule by Napoleon.

Emerging out of the chaos of the French revolution, the French Newton, Laplace proposed a completely secularized version of Newtonian physics. As he confided to Napoleon he did not need the hypothesis of God in designing his celestial mechanics. That said, Laplace took over lock, stock and barrel the mathematical formulations advanced by Newton. The equations did not markedly change; the idea of attractive forces held together by gravity and other inter-atomic forces was not discarded; but the deity was banished. Laplace envisioned a totally materialistic universe. With Laplace the nature of deism became irrelevant for science. The way forward to a totally materialistic theory of nature was firmly established. Darwinism, organic chemistry, and the first industrial revolution pushed materialism even further into the forefront of philosophical and scientific thought.

*The Pendulum Swing in the First Industrial Revolution: Scientific Ideas and Material Forces Conjoined*

With the first industrial revolution the weight of the pendulum swung away from theoretically oriented natural philosophies, Cartesian or Newtonian. The reason is industrialization, the growing use of machines of all types in producing material goods, the mass production of textiles, the substitution of coal for charcoal in metal working, the factory system. Why? Because operating, servicing and improving on machines installed in factories provided – not by intention by as a kind of by-product – thousands of experiments.
The best example is the steam engine. The evolution of steam engine went through many phases but three are of utmost importance: the Newcomen engine; the Watt steam engine with separate condenser; and the high pressure steam engine with multiple boilers. My focus here is on the first two engines.

At the beginning of the eighteenth century the practical engineer Newcomen engaged in building pumps to draw water out of mineshafts contacted Boyle. Boyle suggested using a vacuum pump. Based on this advice Newcomen designed a massive pump with oscillating beam that pulled up lifting containers filled with water out of mines, then swung in the opposite direction dropping the containers back down into the shaft. Steam is injected into the cylinder from which the pumping device moving the beam back and forth emerged. In this phase the cylinder is hot. Now cold water is poured over the cylinder. The steam condensed, the semblance of a vacuum is created. With a cylinder now evacuated the pump does its job, swinging the pendulum beam. Once this phase of the back and forth motion is complete, the cylinder is heated, water being injected first, steam filling the cylinder. The pumping device is set into motion once more. Imagine doing this in a Aristotelian inspired world in which no one believes in creating vacuums. Not likely. The point is ideas concerning the construction of vacuum pumps must exist before you go about the practical business of building the devices. So much for a Greek or Roman world convinced that Aristotle knew what he was talking about.

Now heating a cylinder with water in it requires fire. Creating fire requires wood, coal or charcoal. The less you have to heat the cylinder the less fuel required. Enter the practical engineer James Watt, assistant to the chemist Joseph Black. Black is working on measuring
temperature. Heat water you get steam. There is a precise temperature at which water turns to
steam without the temperature changing. Black dubbed this latent heat. If you overheat the
water you not only get steam. You also get higher temperatures. If you want to efficiently heat
a Newcomen engine you need to know the latent heat required to exactly turn water into
steam without overshooting. Watt learned this from his labors under Black’s guidance. He
applied it in devising prototype stream engines for experimental work. Once set along this road
– a practical one because it deals with reducing the amount of heating required to secure the
requisite amount of steam – Watt continued to follow the trail further. At some point he
realized that constructing a separate condenser would reduce the costs of generating pumping
motion even further. Separate hot cylinder from cold condenser. Operate on the temperature
differential between the two media. You reduce heating costs. Of course fashioning steam
ingines with the requisite valves is not trivial. Practical engineer that he was, Watt was up to
the task.

In pursuing the logic of driving down costs Watt went even further. He realized that an
expansion principle was at work. The steam rushes into the cylinder. The rushing motion has
the potential to do work. Harness this potential by cutting off the injection of steam at a
relatively early point. In doing this you cut the amount of steam you need to operate the device.
You save more money.

In order to get tabs on all of the variables involved in his steam engines Watt installed
pressure gauges and temperature gauges on his engines. He sought precise information
because precision meant money. Followers of Weber might say “time wasted is money forgone;” Watt would say “energy wasted is money lost.”

The crux of Watt’s innovations lies in the idea of a four cycle principle. Inject steam in phase one; cut off steam inflow in phase two; condense in stage three; complete the cycle in phase four. You get pumping action that is economically efficient. You are exploiting the temperature differential between steam creator and condensing agent in the most practical way possible. This is basically the idea exploited by Carnot who developed a theoretical model of work generated by a four stroke engine. It is the first law of thermodynamics in preliminary dress. One of the key ideas of nineteenth century science was forecast in the practical experience of tinkering with steam engines. Industry was driving science; in turn science was driving industry. The pavement for the road to rapid innovation was put down by practical individuals mucking around in the material arena, mainly concerned with driving down production costs. In turn they looked eagerly to the growing number of experimental scientists who were putting the machines of industry to work in their laboratories.

Conclusions

What is capitalism? It is the mobility of capital enhanced by credit creation. It did not take final shape until the first industrial revolution of the eighteenth and early nineteenth centuries. At the core of capitalism is rapid innovation, capital being drawn from declining sectors; capital being pulled in the vortex of expanding sectors; capital seeking the highest rate of return owners of it can realize through investment. Similarly because capitalism takes two forms – merchant capitalism that feeds on international flows and technological capitalism that
feeds on innovation both domestic and international – the mobility of capital is realized both in the domestic and international arena. Stemming from this mobility are ups and downs in domestic production and domestic employment. The instability of capitalism is an insight Marx had, an insight that remains true for the time he wrote – in the mid-nineteenth century – and in today’s twenty-first century world as well.

If Marx was correct in its pinpointing of the timing of capitalism’s emergence and its most salient deficiency – instability – he was wrong in focusing exclusively on material factors. One of the key lessons of this study is that both ideas and material forces matter. Weber, who emphasized the importance of the conceptual environment for the emergence of capitalism in the West, was right about ideology mattering. To be specific he was correct that some form of ancient thought realized in a newer guise mattered. Where he was wrong was his focus on the wrong type of Axial thought, Christian Augustinian predestination.

Why did the West develop capitalism? To borrow Leibnitz’s notion of sufficient reason the answer offered by this paper is simple: the pendulum swing advanced by the ancient Greeks. Why was it so deeply engrained in Western Europe, failing to take off in the Byzantine Empire and in the Islamic world, both of which were heirs to ancient Greek thought? Because neither the Byzantine Empire dominated by the emperor, or the Islamic world dominated by caliphs – each exploiting the masking function Axial style religious belief provides – were rocked back and forth by the pendulum swing in material and intellectual affairs. Out of the turmoil of the pendulum swings emerged triumphant Europe. This is the most important conclusion to draw from this analysis highlighting the relationship between progress and the pendulum swing.
Footnotes


[3] The idea of an Axial Age was introduced when Karl Jaspers set about broadened Hegel’s notion of a great axis of historical change ushered in by the doctrines of Jesus Christ (an embrace of cultural relativism that one might impishly describe as proto-politically-correct thinking). Hegel had promulgated the idea of an historical turning point in his idealist theory of an historical dialectic. Clash of opposing ideas in the form of thesis contested by antithesis giving rise to a new synthesis. Jasper’s argument was all of the major civilizations on the Eurasian land mass experienced Axial change during the period 1500 BCE to 0 BCE. In China, Taoism and Confucianism emerged; in Persia Zoroaster preached a dualistic theory of light wrestling with darkness hidden in gross material
matter; in India, the Upanishads pioneered an intellectual movement leading to *karma* and *ahimsa*; in Greece the poems of Homer and Hesiod presented a world in which fate interacted with powerful gods who invested abiding interest in the behavior of warrior heroes; in the Middle East the Hebrew religion shook off polytheism, eventually declaring themselves the key actors in a magnificent cosmic drama wherein they became the chosen few, bearing the burden of history on their own shoulders as it were. Once framed as a key concept in interpreting how ancient civilization came into being, how to invest this with meaning of us so-called moderns became a matter of fierce debate. Some scholars thinking along philosophical lines, speak about “thinking about thinking”, second-order higher level thought. See the classic presentation in Eisenstadt (1986) and individually penned chapters in two recently published edited volumes, namely Aranson, Eisenstaat, and Wittrock (2005) and Bellah and Joas (2012). For an interpretation that weds material evolution to approaches developed by Weber and Durkheim, see Bellah (2011). For the religiously tinted view that the idea of God entered the world during the Axial Age see Armstrong (2006). The interpretation I give in this text is decidedly my own, differing from the views of everyone else mentioned in this footnote.


[5] Military potential $M$ depends upon the size of the economy from which military leaders extract resources, the relative prices of exerting military force (compared to the overall
price level the relative prices for acquiring and outfitting soldiers, their weapons, transport methods like chariots and horses, the state of roads, geographic impediments and the like), and the military conversion rate $m$, namely the percentage of the total economy that can be commanded by the military sector. Mosk (2013) presents an equation capturing this logic, namely:

1. \[ M = \left( \frac{mY}{p_{mf}} \right) \]

$p_{mf}$ being the relative price of exerting military force and $Y$ is total output or income. Note that $Y$ is equal to per capita income $y$ multiplied by population size $P$ so:

2. \[ M = \left( \frac{myP}{p_{mf}} \right) \]

In short population size is a determinant of potential military capacity. It should be emphasized that this refers to potential capacity. It is not equal to success in warfare. History is replete with examples of cases in which understaffed armies defeated larger threatening forces.


[8] For a concrete example of this phenomenon see Kuhn (1990). Kuhn describes horrific punishments and tortures imposed on individuals who are accused of upsetting, undermining, the "Mandate of Heaven": the heavy wooden claque placed over the head bearing down on the shoulders; the ankle braces that manipulated by a torturer driving
a wedge can eventually reduce the ankle bones to sheer mush; and beating and pummeling in front of colleagues. If this is not to turn your stomach consider forms of capital punishment: beheading; strangulation; starvation in a cage; and the most hideous of all – death by slow slicing. So much for Confucian benevolence aimed at propping up the Mandate of Heaven!


[10] For much of the discussion of Ancient Greece and Greek philosophical thought I rely on the various chapters in Boardman, Griffin, and Murray (1986) that deal with Greece, and upon Russell (1945).

[11] Without a doubt one can make a geographic argument about why Greek politics, military competition, and thought took on an adversarial complexion: by dint of consisting of a massive peninsula, a mainland crisscrossed by mountain ranges, and a group of islands lying off the Aegean ancient Greece naturally found itself divided into regions, each organized around city states dominating their rural hinterlands. Euboea, Laconia, Arcadia, Achaea, Boeotia, Argolis and Thessaly were all distinctive regions competing against one another, as were the city states of Athens, Sparta, Corinth, and Thebes. The problem with this view is that it is not clear at all that Greek civilization began in this crazy-quilt pattern. Nor is it obvious that the competition was driven by
geography; it may well have been driven by clashing ideologies. Or maybe the two arenas – ideas and material reality – co-evolved with one another.


[13] On this point and some of the other insights I offer in my discussion of Greek drama, see Mendelsohn (2016).

[14] For the view that philosophy emerged out of religion and science see Russell (1945). I prefer the term “proto-science” to science since most Greek thinking about material substance was purely theoretical, eschewing experimentation and detailed observation, particularly observation employing instruments. Moreover the reasoning used by the early Greek materialists was highly animistic. Aristotle, who carried the scientific tradition to its apex in the ancient world – his biology was quite advanced – operated in a completely theoretical mode in developing his theory of physics that was shot full of animism.

[15] Whitmarsh (2015: 44-47) refers to this approach as theomachy from the Greek term *theomakhia* “battling the gods.” His point is that the extreme localness of Greek religion – its highly competitive nature – opened the door to the idea that there might not be gods at all.


makes an impressive case for the homeland being situated north of the Sea of Azov, stretching eastward past the Volga and Ural Rivers. See Anthony (2007: 84, 132). Much of the evidence advanced by scholars involves dating the split-offs of various languages from a Proto-Indo-European ur-language that probably developed circa 4500 BCE. In Kennedy’s preferred schema, Anatolian split off around 4000 BCE; Tocharian next; Celtic and Italic next; Armenian and Greek next; followed by the splintering into Indo-Iranian, Balto-Slavic and Germanic. McEvedy (2002: 10) pretty much agrees with the timing of the split-offs – he accepts the notion that it gradually occurred between 3000 BCE and 1500 BCE – but provides a different model. In his framework there is an initial division into a Hittite group and two Indo-European groups (east and west Indo-European), the latter two groups subdividing into a welter of languages including Hindi, Farsi, Polish, Russian, Greek, Albanian, French, Italian and Spanish. Doniger (2009: 87-95) considers some additional scenarios, including one in which an Indus Valley group responsible for the Vedas was actually the original Indo-European group, subsequently expanding westward and northward.


[20] To put these figures in some meaningful context consider Maddison’s estimates of per capita income in Europe. Around 1000 CE he figures it was $431 (1990 Geary-Khamis $) dollars; around 1500 $753; and around 1820, $1,202. Scheidel (2014b: 4) warns us against expecting accurate estimates of per capita income for the Roman Empire. I
cannot dispute his assertion. The main reason why I report the estimates assembled in Table 1 is to illustrate the importance of regional differentials, particularly the largess of the metropolitan center enjoyed by the elites ensconced in Rome.

[21] The typical interpretation of the Malthusian framework focuses on its dynamic implications: population increase reducing the standard of living provided technology, land, and capital remain unchanged. Perhaps more telling is its implication for the distribution of income arising at any specific date. Increase the number of workers, wages fall relative to land and capital rents. Increase the amount of land, wages rise relative to land and capital rents. Successful Roman predation in the four centuries between 200 BCE and 200 CE, tended to raise wages - relative to land rents - simply because it added on land, increasing the land base relative to the labor base, to that already under Roman rule. Key to this thesis is the observation that population densities tended to be lower in the newly conquered lands than in the old core regions of the Roman Empire.

[21] On the website supplementing Scheidel (2014a) – on the internet at www.stanford.edu/~scheidel/CCRE.htm (accessed on May 2, 2016) by this author - Scheidel provides the following estimates of climatic conditions:
<table>
<thead>
<tr>
<th>Location</th>
<th>Climatic Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest Iberia, 250 BCE – 450 CE</td>
<td>Warm</td>
</tr>
<tr>
<td>Northwest Iberia, 450 – 900 CE</td>
<td>Cool</td>
</tr>
<tr>
<td>Northwestern Italy, 200 BCE – 100 CE</td>
<td>Warm</td>
</tr>
<tr>
<td>Northeastern Italy, 400 BCE – 1 CE</td>
<td>Warm</td>
</tr>
<tr>
<td>Northeastern Italy, 450 – 700 CE</td>
<td>Cool</td>
</tr>
<tr>
<td>Central Asia, 100-200 CE</td>
<td>Warm</td>
</tr>
<tr>
<td>Central Asia, 200 – 1000 CE</td>
<td>Cool</td>
</tr>
</tbody>
</table>


[25] The view that capitalism developed in the ancient world has been vigorously argued by a number of writers providing chapters for the volume edited by Neal and Williamson. See Jurca (2014) on Babylonia in the first millennium BCE; Bresson (2014) on the Greek city-states during the Hellenic era; and Jongman (2014) emphasizing the importance of rising slave prices in the Roman economy during the first centuries BCE.


[27] I draw upon O’Donnell (2015) for this account.
The Roman gods are fundamentally the Greek gods: Jupiter is the Latin name for Zeus; Juno the Latin name for Hera; Neptune the Latin name for Poseidon; Saturn the Latin name for Cronos; Venus the Latin name for Aphrodite; Pluto the Latin name for Hades; Ceres the Latin name for Demeter; Minerva the Latin name for Athena; Mercury the Latin name for Hermes; and Cupid the Latin name for Eros.

Quoted in Russell (1945: 248-249).

Many accounts of the lives and (often untimely) deaths of Roman Emperors exist. Still it is hard to beat the classic account penned by Gibbon (no date).

For a discussion of the various first and second century Christian beliefs and practices see inter alia Brown (2015) and Madigan (2015).

For details see Liu (2010: 24 ff).

This paragraph draws heavily for Liu (2010: 76 ff).

Mecca emerged as a major trading center after Petra – and Palmyra in Syria, its successor entrepôt conurbation – lost its cache due to fighting between the Byzantine rump of the Roman Empire and the Parthian/Persian Empire to the east. See McAuliffe (2006) for an interesting discussion of the politics prevailing in Mecca at the time of Muhammad’s youth.

For the life of Muhammad see Ramadan (2007).

Quoted in Kuran (2011: 105).

The most important sectarian split within Islam – that dividing the Sunni and Shi’a communities – occurred within a century following Muhammad’s death. While the split involved the question of who was the rightful caliph (political/spiritual) leader of the Islamic community, it intensified later on. Particularly decisive for subsequent disputes over scriptural authority was the fact that Islamic armies brought Persian and later Indian lands under their control. Before Islam arrived, Persians were mainly followers of Zoroastrianism, a faith rooted in pronounced dualism, the forces of pure Light opposing the materialistic forces of Darkness. It was a faith sharing many beliefs with Gnosticism; indeed perhaps the seeds of Gnosticism sprouted in Persia. As Islam evolved from a core faith largely restricted to Arabian lands to one governing a diverse ethnic community consisting of peoples gradually abandoning earlier beliefs - rooted in Christianity, or Judaism, or Manichaeism, or Zoroastrianism, or Buddhism, or Hinduism - it became a “big tent” religion, housing under its umbrella a variety of potentially conflicting worldviews and a remarkable variety of rituals.


See Kuran (2011: 138), Labib (82 ff) and Tsugitaka (2012). Labib goes so far as to argue that the Karimi set up stock exchanges (funduqs). It should be noted that in his detailed study Kuran (2011) there is no mention of the exchanges.

See Leicester (1965), McClellan III and Dorn (2006), and Saliba (2007).
Intensifying the distinction between the sacred and the secular was the decision of the Roman Catholic Church to declare it was a corporation, running its business according to its own, new, canon law (*jus novum*). This occurred during the late eleventh and early twelfth centuries, intensifying a split that had been in the making for centuries as the Church struggled over its relationships with the Holy Roman Emperor and the feudal lords. See Brady (1991), Marcus (1990), Kuran (2011: 102 ff), and Morrison (1969). Rubin (2010) argues that the fact that European merchants could handle their legal affairs through secular courts as opposed to religious courts made it easier for European merchants to build upon the bill of exchange and the fashioning of trusts than was true for Muslim merchants dealing exclusively with religious courts.


Papal claims over territories and palaces in Italy were based upon an infamous forgery the Donation of Constantine. That it ultimately was proven a forgery was due to the labor of linguists who pointed out that the Latin appearing in the document was far too crude, far too shot full of pathetic phrasing, to have been composed in fourth century Rome.

Russell (1945: 409).

This account is based upon the account given by Madigan (2015: 139-142).

According to Stark (2003) Jews were treated equally badly in the Islamic world and in the Christian world. He shows that the anti-Semitic violence that besmirched the
Christian west during the Crusades was matched by attacks upon *dhimmi* Jewish communities. Speaking personally I find this unconvincing for two reasons. Prominent Jews, allowed to practice usury banned to Christians, operated as financiers in the West whereas, as we have seen, under Islam ways around charging interest were well entrenched for Muslims prior to the Crusades. Second Jews were accused of being the killers of Jesus by Christians; Muslims, denying that Jesus was crucified (and denying that he was a deity), were less likely to despise Jews than were Christians of the Middle Ages convinced the blood of Jesus was on Jewish hands.


[49] For details of this thesis see Rubin (2010).


[51] On the evolution of the various monastic orders see Décarreaux (1964), Lawrence (1984) and Wittberg (1994). Coulton (1989) paints a grim picture of the monasteries, admittedly those surviving into the late medieval period when corruption and cruelty was all too common among the ranks of Abbots and run of the mill monks. As one example of cruelty practiced by Abbots, Coulton mentions the practice of burying peasant women and serf women caught stealing alive. The idea was to dig a grave so deep that the stench exuded from their rotting flesh would be snuffed out by the layers of dirt thrown onto their bodies.
My discussion of the Cathars and Waldensians draws upon the account in Madigan (2015: 188-195).

See Duby (1981).

For the importance of alchemy to the so-called scientific revolution of the seventeenth century see Moran (2005).

This description rests heavily on the treatment given by McClellan III and Dorn (2006: 73).

For an extensive treatment of mercantilism see the classic account of Heckscher (1955) and Chapter 5 of Findlay and O’Rourke (2007).


For the details of this argument, see Mosk (2011, 2013) and the Appendix to this paper.

See Richardson (2005) and Richardson and McBride (2009).

This is the thrust of the argument made by Richardson (2005).

In late medieval Venice the institutional relationship between guild and religious brotherhood was a bit different. A religious brotherhood was known as scuola while the craft guild corresponding to it was called an arte. In practice the overlap between scuola and arte was very high. See Mackenny (1987).


The career of Leonardo da Vinci illustrates how competitive fragmented Europe had become by the time of the late medieval period. Commencing his career in Florence as an apprentice in a Florentine painter’s guild, the Company of St. Luke, Leonardo went on to work under the sculptor Verrocchio who took in commissions of all sorts: art, armor, jewelry, and church bells were all part of the business. Showing no loyalty to Florence, Leonardo moved on to Milan where he advertised himself as a military-engineer (in a letter to Duke Lodovico), apprised of secret techniques for manufacturing catapults, chariots, and cannons. In Italy, divided into a myriad of squabbling city states, an artist had to go where the patronage was good, the opportunity to bring in commissions strong. Accepting the patronage of Cesare Borgia Leonardo travelled throughout Italy, eventually ending up at the Vatican in Rome. Returning to a Milan in 1515 that was recaptured by Francis I of France Leonardo ended up living in France where he died.

In terms of the theme of European pursuit of precision, it is worth mentioning that one of the most remarkable features of Leonardo’s painting is its remarkable attention to detail. Characteristic of the late medieval period, Leonardo acquired a detailed knowledge of anatomy based on years of studying cadavers and skulls. Beyond this, it was in the late medieval period that painters pioneered the concept of perspective, allowing them to give the illusion of depth on a flat surface. In this endeavor, mathematical logic is put to work solving a problem in pure aesthetics.
As well Leonardo’s story illustrates the how the fragmentation of Europe gave patronage leverage in competing with guild attempts to control technology and training during the late medieval ages.


[66] I write “so-called scientific revolution” because I am convinced the term is misleading. It is misleading because the advances in science made during the seventeenth century were mainly concentrated in the fields of physics and anatomy, not in chemistry was still mired in alchemy. It is also misleading because the key figures – notably Descartes, Newton, Leibnitz, and Boyle – thought of themselves as natural philosophers not scientists. Indeed common use of the word “scientist” does not gain currency prior to the nineteenth century. Shapin (1996: 1) captures the paradox arising from assigning the scientific revolution to the seventeenth century with his bold opening line “There was no such thing as the Scientific Revolution and this is a book about it.” Along the same lines one can argue that the act of putting names on periods of history is itself a historical process, historians working at particular points in time looking for imagined break points upon which they can hang their pet theories about the nature of change. For example Le Goff (2015) convincingly argues that historians obsessed with the idea that the European medieval era constituted a dark period when knowledge and culture atrophied - ancient Greek and Latin culture being almost totally abandoned - created the idea of the Renaissance is a distinct period in history. Believing that the revival of ancient learning was key to moving forward towards modernism they created a unique
historical era – unique because it was limited to Europe – during which the straightjacket of the dark period was finally wrenched off, light bursting onto the European stage. Le Goff’s thesis is that the medieval period does not really end until the onset of the first industrial revolution of the eighteenth century. I concur, eschewing the use of the term “Renaissance” in this paper.

[67] See Landes (1983: 72-75, 80-81, and 86-87). Mokyr (1990) refers to the mechanical clock as a macro-invention, one spawning a myriad of micro-inventions. In particular Mokyr (1990: 50) emphasizes the fact that the practice clock-making induced specialist artisans to reach for new standards in the accuracy required to create reliable mechanical devices. In short manufacturing along precise lines became an indicator of quality, something sought after by elites. For a classic account of mechanical inventions see Usher (1929).


[70] It is worth noting that Huygens sought a patent for his clock with pendulum as regulator from the government of France. It was turned down because the French government wanted to avoid dealing with protests from the master clockmakers who used the political clout of their guilds to stifle patent competition. See Turner (2008: 269-270).

[72] For the use of the term “natural philosophy” – as opposed to science – see footnote #66 above.


[74] See Hall (1962: 61). Technically the sun did not sit at the exact center of the universe as conceived by Copernicus. However it was very close to the center. Fara (2009: 65) argues that Islamic predecessors to Copernicus had revised the Ptolemaic framework by introducing devices similar to those introduced by Copernicus.


[76] For a detailed account of the tangled relationships developed between Galileo, Brahe, and Kepler, see Koestler (1959, 1986).

[77] For a salutary debunking of heroism in science, dispelling myths from the ancients to Einstein, see Fara (2009).

[78] The remainder of this paragraph is based on Fara (2009: 143 ff).


[80] The American revolutionaries went one step further than the British did in attenuating the political pendulum swing. The Constitutional checks and balances of the United States – power divided between the executive, legislative and judicial branches at the
federal level; as well power divided between states and the federal government – was designed to create a mechanical form of government that would not explode into fragments, old constitutions being scrapped in favor of new ones, a practice imbedded in French practice but not in the British tradition.

[81] For the discussion of the science of the steam engine I draw heavily upon Chang (2007).
Appendix

An Augmented Production Function Dividing Knowledge into Two Forms: Knowledge

*Embodied in the Qualities of Labor, Land and Capital; and Disembodied General Purpose Knowledge Taking the Form of Ideas*

The idea here is to express output generating by a population residing in a politically defined jurisdiction into the product of a function of three factors of production – labor, land and physical capital each augmented by knowledge multiplied by a second variable, total factor productivity \( A \) that is a function of general purpose knowledge (ideas), economic structure (the composition of the labor force divided into three sectors, agriculture, manufacturing, and service sector, each sector being further divided into subsectors) and scale economies.

In formulating this equation I draw upon Mosk (2013) that uses it in explaining why nationalism spreads in the post-seventeenth century world. The exact equation appearing in Mosk (2013) differs slightly from the one I develop below but the idea is the same.

Following standard Cobb-Douglas expressions of output used by economists, I write per capita output \((q)\) as:

\[
q = A \cdot f(l^a, k^a, la^a) = A \cdot \{(l^a)^\alpha \cdot (k^a)^\beta \cdot (la^a)^{(1-\alpha-\beta)}\}
\]

\(A\) being the index of total factor productivity; \(l^a\) being labor input per capita adjusted for hours worked \(h\) and the efficiency of an hours worked (that depends on the diffusion of knowledge concerning production); \(k^a\) being per capita capital adjusted for the quality of capital (that depends on the knowledge embodied in the physical machines and structures); and \(la^a\) being
land adjusted for the quality of land (e.g.: irrigated fertilized land enjoying a warm climate being superior to parched dry fields left to grow weeds).

Using a little symbolism to tidy up this presentation I write:

4. \( l^a = h^e(h)^w \), \( w \) being the proportion of the population in the labor force (the proportion of the populace who are workers), \( h \) being hours worked per worker, and \( e(h) \) being the efficiency with which people toil at their tasks;

5. \( k^a = q_k^k \), \( q_k \) being the quality of capital (a function of the embodying of knowledge in machinery, structures and transport vehicles and the extent to which physical capital is devoted to production); and

6. \( l_a^a = q_{l_a}^l \), \( q_{l_a} \) being the quality of land (e.g.: expressing its inherent capacity to produce crops consumed both by animals domesticated by farmers and crops consumed by human consumers.

One of the pleasant features of this presentation is the fact it can be easily turned into a statement about growth rates \( G(x) = \frac{dx}{x}, dx = x_2 - x_1 \), being the change of a variable \( x \) on its base.

7. \[ G(q) = G(A) + \alpha[G(h) + G(e(h)) + G(w)] + \beta[G(q_k) + G(k)] + [1-(\alpha+\beta)] * [G(q_{l_a})+G(la)] \]

Another benefit offered up by this formulation is the fact that \( \alpha \) is simply the share of income enjoyed by owners of labor; \( \beta \) is the share of income secured by owners of capital; and the term \( [1-(\alpha + \beta)] \) is the share of income secured by land-owners.
Actually as it turns out this austere formula is akin to a fruit tree loaded with fruit. To start with the low hanging plum we can derive some important conclusions about the nature of capitalism. (1) Capitalism is a system in which $G(A)$, $G[e(h)]$, $G(q_k)$ and $G(q_{la})$ are large relative to the growth rates of the other variables. (2) Because $G(A)$ is relatively large, structural change is rapid, capital moving at a feverish pace from one sector to another sector, and from the home market to foreign markets.

Nor is this all: some more plums fall from this tree. Consider the debate between followers of Marx and followers of Weber. Both schools of thought argue that a speed-up of capital growth $G(k)$ is crucial to capitalism. Agreement ends at this point.

Weber emphasized the growth in hours worked, $h$, and the efficiency with which people worked $e(h)$, and science impacting the growth in total factor productivity $G(A)$. Bundled together these constitute the so-called “iron cage” brought in through the spread of the capitalist spirit.

By contrast Marx emphasized the growth in quality of capital $G(q_k)$. Let me start discussing this concept in terms I believe Marx himself would find agreeable. His concern was with the organic composition of capital, the substitution of fixed capital – think steam engines, railroads, power looms and lathes – for variable capital, raw materials like cotton fiber and coal. He viewed increases in the second kind of capital bolstering the demand for labor, while the second kind of capital automated workers out of their jobs. His famous thesis was that forces of capitalist accumulation would lead to fixed capital forcing out variable capital, throwing
workers out of their employment, undermining their skills, rendering them redundant. In terms of the formulation I use here Marx saw $q_k$ rising as fixed capital displaced variable capital.

In short Marx was imagining capitalism as a two-sector system, a capital goods sector co-existing with a consumer goods sector. Herein lay the source of capitalist instability. Workers made redundant by fixed capital accumulation cannot consume products thrust onto the market by the consumer goods sector. Moreover those persons still able to hang onto their positions as factory workers live in a precarious world. The ranks of the unemployed threaten their standards of living because the so-called labor elite know full well that capitalists can fire them, bringing in unemployed or underemployed substitutes from the growing pool of displaced employees. Wages fail to rise: why should they? Strikes will fail: why should they succeed when potential scabs are circling factory districts? So even those not pushed to the margins of society face difficulties purchasing the growing array of mass produced goods – clothing, processed foods, ceramics – spewed out by the consumer goods sector.

In the second volume of *Capital* Marx played with a simple linear two sector model of a capitalist economy. His aim was to demonstrate its great instability. The multiplier is the keystone of his thesis. Downturns in the consumer goods sector translate into reduced demand for capital goods. The economy falls further and further way from full employment. Workers see the handwriting on the wall. They overthrow the system, establishing socialist rule.

Following Marx, later Marxist theorists argued that under worker managed socialism, state ownership of key industries counteracting the octopus like control of capitalists over
production—eventually to be done away with under communism in which the state allocates all capital through systematic planning—stability could be won.

I agree with Marx that instability is a characteristic of capitalism. I agree that capital quality is crucial. However I part company with his argument regarding the nature of capital quality. For me the most important aspect of capital quality is its embodying technological change. Interacting with disembodied technological change captured in the total factor productivity parameter, improvements in capital quality do tend to automate workers out of jobs. Employees are deskilled, striping older workers of their advantage over younger workers. In this I follow the reasoning of Schumpeter (1939, 1964) in his remarkable account of the long-run Kondratieff wave - prices rising during innovation, falling during subsequent busts; profits growing at a fevered pace as new technologies are brought to bear, driving down production costs, only to be followed by unhappy squeezes on returns; employment opportunities soaring during the upswing phase, then crashing as bankruptcies spread during a protracted downturn - over the course of half century long periods. At the heart of this mechanism of capitalist production are waves of innovation upon which ride new technologies that once incorporated into state of the art production render impotent those firms clinging to out of date production methods, to fall by the wayside during mercilect “creative destruction” phase.

Since the mobility of capital is crucial to capitalism as I conceive it one of the salutary stabilizing factors in this story is the migration of financing from dying to growing sectors. Still this is not enough. In competing against communism which did offer stability through State Capitalistic centralized planning, guaranteeing employment – albeit in inefficient enterprises –
capitalism had to change. To survive ideologically it had to abandoning its callous treatment of marginalized groups. In the long-run demand management operating through monetary and fiscal policies (so-called Keynesianism), bailouts of failing firms by government, and the redistributive actions of the welfare state providing some kind of safety net to those relentlessly sidelined by creative destruction came to the fore to save capitalism from its most odious consequences. This story, however, that illustrates the pendulum swing approach I develop in this paper, will not occupy us here.

In conclusion I would like to note that I chose sides with Weber regarding the importance of “demystification”. I view advances in science as crucial drivers of the innovation waves emphasized by Schumpeter.
Bibliography


------ (1923) [F. Knight trans.] *General Economic History*, (London: George Allen & Unwin Ltd.).


