

Balanced Trade: Toward the Future of Economics

By Mike P. McKeever / 1997

INTRODUCTION

The International Labor Organization thinks that the world is in crisis levels not seen since the Great Depression of the 1930's: one billion people are unemployed or underemployed caused by massive underemployment in developing countries and persistently high jobless rates in industrialized countries. In wealthy industrialized countries, people without jobs for long periods of time are at risk of becoming a permanently excluded class while people in developing countries are simply without hope. ("World Employment 1996/97 - National Policies in a global context," as quoted in *The Jobs Letter*, December 20, 1996, Jobs Research Trust, P. O. Box 428, New Plymouth, New Zealand)

Many economists and the ILO think that economic growth toward full employment is the solution to this potential catastrophe. But, there are some difficulties with economic growth as the solution. First, there is a legitimate concern that the earth's physical resources cannot tolerate indefinite economic growth as currently practiced. The vision of billions of people using resources at the rate of consumers in today's industrialized countries frightens many responsible observers.

Second, the economic theories used by policymakers today do not address adequately the problem of encouraging environmentally sustainable job creation. Economists and politicians seem to be divided into two competing positions, neither of which seems to have a handle on providing answers to the questions raised above. Today's economic thought divides itself into either practical, mercantilistic policies of helping one's own country at the expense of others or global free trade policies designed to produce the most consumer goods at the least possible cost.

This article proposes a solution to the problem of creating environmentally sustainable job creation. The solution, named Balanced Trade by the author, is described in some detail below.

OVERVIEW OF TRADE THEORIES

Before discussing Balanced Trade this article provides an cursory overview of current economic and trade policy thinking. This overview is meant as an introduction to various policies and not as a definitive statement of each. Those readers familiar with current thinking on economic policies may skip ahead to the section on the foundations of free trade.

With regard to the creation of jobs and wealth within a national economy, today there is general agreement among economists and policy makers that internal free markets are the most efficient model for producing jobs and incomes within a national economy. This article assumes that free markets combined with appropriate regulation and infrastructure maintenance within a domestic economy are the best model.

However, international trade has a growing impact on domestic jobs and wealth creation. Further, there is little comparable agreement on which trade and international economic relations policies are best – or even what is the proper definition of a national government. Is the GATT a good thing or a bad thing? What is the proper role of the French government when the country is part of an European Economic Union that includes a common currency, common public welfare laws and specific budgetary targets set by the European Legislature?

Currently, a large part of most governments' national trade policies results from business interests lobbying. Every country has huge lists of products which may be imported, products which may not be imported and how much tax must be paid on imported goods. When domestic manufacturers worry about foreign competition, the taxes on competing products are high and the restrictions are onerous. But, when powerful business interests make money from imports the taxes on imports are low and the restrictions are easily managed.

Several economic theories about the proper role of government in managing trade relations have been developed over the centuries. Here is an introduction to some of those theories:

AUTARCHY: No trade. Autarchic governments attempt to eliminate all imports and exports, forcing their subjects to live with whatever the local economy can provide. These governments apparently believe that all other cultures are so evil or corrupt that any contact will harm their people. No responsible government engages in this practice today because the benefits of trade are so apparent. Recently, North Korea and Albania came close.

MERCANTILISM: Trade for national advantage. Mercantilists believe that the world has a finite store of wealth; therefore, when one country gets more, other countries have less. Mercantilists restrict imports and encourage or subsidize exports as a conscious policy to make their citizens better off. Some Asian countries use this policy to good effect in expanding their wealth by expanding exports and curtailing imports. Japan is an example of a country that has taken this policy too far – now its export surplus has raised the value of its currency so high that much of its labor is priced out of the world market. Many developing countries use this practice to secure good markets for their exports while protecting their market from foreign imports.

PROTECTIONISM: Protectionists restrict or tax imports to benefit domestic manufacturers and keep as many jobs at home as possible. Protectionists believe that the benefits from keeping jobs at home outweigh any loss of consumer surplus resulting from higher prices after tariffs. Exports are ignored by protectionist governments as are imports for which there is no domestic competition. Although rarely used as a stand alone policy, protectionism is frequently used as an accusation by those promoting free trade access to foreign markets for their own companies.

STRATEGIC TRADE: This policy requires or encourages domestic companies to make goods needed by the military instead of relying on foreign companies for strategic goods. Also, this policy seeks industries that will grow in the future and provides protection and encouragement to companies in those industries in the home market. For example, some argue that the United States' space program is a method of helping the aerospace industry by providing government funded R & D for new products.

FAIR TRADE: This is a new movement that tries to provide more of the profits from trading directly to the producers in third world countries by using consumer preferences for helping people and by eliminating the middlemen from the trade process: for example, grocery wholesalers in Europe buy fruit directly from growers in Central America, eliminating profits to the large, multi-national trading companies. ("Free Trade vs. Fair Trade", Global Exchange, 2017 Mission Street, Room 303, San Francisco, CA 94110; (415) 255-7296) Consumers appear to prefer fruit labelled as coming from a Fair Trade system. This is a laudable idea and will help those producers who benefit from it; unfortunately, it requires so much entrepreneurial effort from the participants that it is unlikely to become a serious, long-term threat to large trading companies except in some limited markets. Further, these efforts rely on the private sector for implementation. Government policies can do little more than remove barriers to their implementation in a free market economy.

FREE TRADE: No restrictions on trade. Free Traders say that unrestricted market forces will create the most good for the most people by directing resources to the most efficient countries. To achieve worldwide efficiency, trade must be conducted without regard to national concerns; therefore any temporary imbalance in a country's foreign exchange settlements or domestic living standards is without consequence. Free Traders also believe that any action to interfere with free trade will result in a "trade war", wherein a country's trading partners will enact retaliatory laws to eliminate any benefit the initiating country receives from a protectionist policy.

Free Trade benefits multi-national corporations by opening markets to their products which might otherwise be restricted in some fashion. It also benefits consumers by making the manufacture of goods become as cheap as possible since manufacturers seek out countries with the lowest cost production. Many countries which have adopted this policy have seen their economy grow as a result. The question is whether the benefits to individual citizens from imports which cost less than goods made in the home country are more than offset by the resulting loss in jobs and wages to local citizens. Some observers fear that a "race to the bottom" resulting from the mobility of capital in seeking low cost production will lower everyone's wages to the lowest wages in the world.

The United States of America is the prime mover behind this policy because it sees the opening of foreign markets as the best way to address its long standing trade imbalance of imports over exports. This is a new development since this policy began as industrialized countries opening their markets to poor, developing countries while ignoring them as export markets. Unfortunately, many international lending agencies have adopted this policy as a requirement for borrowers, although the effect of adopting this policy is frequently to eliminate any possibility of a favorable trade balance in the borrowing country.

Free Trade Theoretical Foundations

Free trade has occasionally demonstrated a level of success where it has been adopted as national policy; however, it has also demonstrated the power to create misery and deprivation in other places where it has been adopted. Conversely, some countries have created vast amounts of wealth for their citizens by simply ignoring free trade. Evidently, this policy is not a universal panacea and prudence indicates that it be examined critically. Since the USA has considerable influence and since its trade imbalances are unlikely to disappear any time soon, the USA will continue to push for free trade to open markets to exports from its companies.

There is a considerable body of economic theory which appears to support the concept and it is worthwhile to examine that theory in a critical light. After all, free trade is simply extending the concept of free markets to the worldwide arena. Experience proves that this concept does increase trade and the GDP's of trading partners. But, there are many problems with a simple extension of policies that work well inside a culture, nation and economic system to encompass other nations, cultures and economic systems.

Extending free market policies to international trade is based on a few, specific economic theories. If the theories underlying free trade are wrong, then it can be assumed that free trade is an flawed concept needing careful monitoring and modification. Here is a critical discussion of the theoretical foundations of free trade:

1. Comparative Advantage: Ricardo's Theory/Law says that increased trade increases the welfare of both producer and consumer in almost all cases (Dominick Salvatore, INTERNATIONAL ECONOMICS, 5th ed., 1995, Prentice Hall, pp 30-38).

Ricardo demonstrates that trade will occur to the benefit of any two nations even when production of all goods is more costly in one of the countries. Trade occurs when the relatively lower cost good in the more costly country is traded for the relatively lower cost good from the lower cost country. If country A is four times as efficient as Country B in producing wine while A is only two times as efficient as B in producing cloth, country A will specialize in wine and Country B will specialize in cloth. Each country will specialize in the production of the good for which it has a comparative advantage in production costs and trade for the other goods. In the long run, consumers in both countries will be better off with trade than without trade. Free trade is the only way to achieve efficient production of goods and services. It is how producers are able to find the lowest cost method of production in a global economy.

The flaw in this theory is that it assumes that all the factors of production stay within one country. The theory assumes that when export demand favors one product over another, businesses easily change from producing one product to producing another. But, factor markets today are international for capital and not for land or labor: capital can cross national boundaries easily while labor cannot. When capital crosses national boundaries, then production is moved to the lower cost country; employment increases in the foreign country instead of moving to another business within the same country. Employment and welfare in the higher cost country is reduced; consumers and producers in the higher cost country suffer. Goods are produced more cheaply, but

consumers in the high cost country lose incomes as they gain lower prices while consumers in lower cost countries gain less than is lost from higher cost countries due to the wage differential.

To compensate for this flaw the theory should be revised to say that trade increases consumer and producer welfare when the factors of production (capital, labor, land and entrepreneurship) are restricted to one country and therefore move to producing alternate goods within the same country. Further, trade reduces consumer and producer welfare in at least one country when one or more of the factors of production are able to cross national boundaries and others cannot. Land is absolutely immobile and labor is mostly immobile; perhaps it is time to recognize that this theory does not have universal application.

2. Welfare for all is maximized when goods are produced in the most efficient (lowest cost) manner possible:

This is the basic argument for Free Trade and draws its justification from Ricardo. However, real events provide a contrary argument: "...But while we predicted grim outcomes from NAFTA, no one foresaw the horrendous catastrophe which has suddenly converted Mexico from the success story of trade liberalization into a global economic basket case. To keep the wolf from the door, Mexico has already borrowed billions of dollars, and has a line of credit for billions more. Even if the peso can be kept from slipping further (and so far there is no certainty of this) the burden of repaying the debt, along with the hardships of the devaluation itself, will fall largely on the backs of the poor, whose real wages continue to plummet. To pay off these loans, Mexico will have to escalate its austerity measures (similar to those often demanded by the World Bank's Structural Adjustment Programs). In other words, the Mexican people can expect further reductions in public services, further reductions in real wages, increased taxation and more user fees for health and other social services. Already this has involved a huge increase in the price of oil (35%) and basic goods, while wages have been frozen. Meanwhile, federal sales tax on most goods was raised from 10% to 15%..." (David Werner and Jason Weston: "The Hidden Costs of free Trade: Mexico Bites the Bullet" as reprinted in Luis Lopezllera's periodical "La Otra Bolsa de Valores", 1995)

3. Balance of Payments Accounting:

Currently, economic theory (Federal Reserve Bulletin listing of US balance of payments; Dominick Salvatore INTERNATIONAL ECONOMICS, Fifth Edition; Robert J. Carbaugh, INTERNATIONAL ECONOMICS, Fifth Edition) claims that all inflows and outflows of money to a national economy that do not reach a zero balance will be

balanced automatically to zero by international borrowings. In other words, it doesn't matter if there is a surplus of imports over exports (negative trade balance) because the country will automatically borrow the difference.

This assumption has numerous problems. First, any money borrowed must be repaid. The repayment costs are frequently not borne by the same people as those who borrow. Second, there is no such automatic mechanism – conscious decisions are required to implement the policy. Someone, probably a business firm, has to request a loan from someone, probably a banker, who has to agree to make the loan. Balance of payment loans from the International Monetary Fund have severe conditions and restrictions that make them an unwieldy source of borrowing. Third, if the borrower pledges some property as collateral for the loan, then some of a country's productive assets have been sold to foreigners. Fourth, if all deficits in trade balances were automatically covered, then exchange rates would never change. Of course, that is absurd. Lastly, this theory assumes that all currency movements are accounted for by official statistics; this ignores cash transactions and is equally absurd.

BOP theory must be changed to recognize that money out/inflows actually do occur. If we remove the fictional concept that any money flows between countries are automatically modulated by international borrowings, then we must address the real effects of international flows of money. This will necessitate a more critical look at free trade and the global efficiency theory for this reason: trade imbalances are not automatically offset by international borrowings – they have real consequences.

4. Money and capital flows between countries do not matter since currency is not wealth:

One of the arguments for free trade is that a country's currency is merely paper representing debt while the true wealth of a country lies in its people, resources and trade capacities. True enough: currency is merely paper and not "real" wealth. However, moving currency from one country to another country does in fact increase wealth in the recipient country and reduce wealth in the donor country. This is so because the recipient country uses the new money to expand its own money supply and productive activity through the fractional reserve banking system. This means that a billion dollar gain to a country's consumer welfare as a benefit from lower prices resulting from lower costs for imported goods is more than offset by a five billion dollar loss in the country's money supply due to the contracting effects of the fractional reserve banking system assuming a 20% reserve requirement.

5. Sovereign governments have no power to stop capital flows:

There is already a large pool of currencies outside of national control and it is presently easy for TNC's to move money around. Many governments are corrupt and inefficient. Granted. But, it can be done. Chile presently keeps the value of its currency artificially low by simply refusing to sell more currency than it wishes, regardless of the price offered; this gives Chile's exports an advantage in world markets. It can continue to avoid retaliatory devaluations because its exports are to US dollar countries and are very small compared to total trade flows.

6. Global companies are so strong that all actions must be taken by many countries in order to have any effect:

All international activity is conducted between two parties in two countries and is bi-lateral at its core. Each country has different laws, customs, regulations and currencies necessitating separate agreements in each two-country agreement. While governments may voluntarily agree to act in concert with each other, as in customs unions, trade associations, etc., any sovereign nation may change its mind and opt out of a multilateral agreement at any time. If that country is willing to face the consequences of loss of borrowing capacity, possible loss of trade partners and so forth, there is nothing anyone can do about it short of an armed invasion; of course, there may be political pressure to stay in the agreement because of "prohibitive costs" to the damaged parties, which are most likely to be TNC's with an ox about to be gored. A sovereign government must constantly measure the benefits of international cooperation against the costs of the cooperation. When the costs exceed the benefits, it should withdraw.

7. Any act to restrict or control capital movement to foreign countries will create immediate retaliatory actions that will negate its effects.

The highest law of any country is to protect the welfare of its people. Even the IMF recognizes that with a provision that countries may undertake a balance of payments related devaluation of up to 10% without any problem. A government which fails to protect its people is a candidate for revolution. If a government decides that it wishes to keep its capital at home, then other countries may be upset – but, most nations already have such regulations in place.

8. Innovation results from free capital movement and would be reduced with capital controls:

Capital seeks returns; if it cannot find high returns overseas, it will seek returns in new ventures at home, thus creating jobs and wealth in

technologies which are more friendly to the native environment than are the Global stuff we have now.

Conclusions about Free Trade

The basic conclusion to draw from the foregoing is that the theoretical foundations of the free trade philosophy are incorrect when they suggest that free trade is an automatic benefit to its participants regardless of trade balances and that benefits from lower prices to consumers always outweigh any harm to producers in a country. The practical effects of such a policy on an international scale is to accomplish contradictory ends. On the one hand, free trade increases trade and makes economies grow. On the other hand, it facilitates the stripping of money and wealth from lesser developed countries to industrialized countries. Further, it rewards countries which follow mercantilistic trade policies.

Finally, this policy will not correct the USA's problems. It is very unlikely that the USA will see foreign markets open sufficiently to redress its trade imbalances. The US government will have to address the trade imbalance directly at some point by restricting imports through tariffs, quotas or other restrictions – it cannot continue indefinitely borrowing to cover current consumption of cheap imports.

This theory has provided, and continues to provide, national governments a theoretical justification to abandon their responsibility to protect their citizens from the harm which can result from trade in the name of "global efficiency". This same theory has provided an economic model whereby a country opens its borders to Free Trade, imports lots of goods from hard currency countries, creates a larger foreign currency deficit, requires a hard currency loan to pay off its foreign currency debts, gets the loan with the conditions that the government impose an austerity program internally so that the new loan can be serviced and then experiences the natural consequences of increased poverty, misery, disease, violence and death.

BALANCED TRADE – AN ALTERNATIVE

Viewed in this light, the question becomes how a national government may enact policies which use the benefits of trade while ameliorating the negative effects of uncontrolled free trade. I hereby propose the idea of **BALANCED TRADE (BT)** as a better alternative to all the foregoing trade theories to create environmentally sustainable jobs. Although the theory is named Balanced Trade, it covers specific actions within a domestic economy as well as trade policies.

BT is a simple concept which says that a country should import only as much as it exports so that trade and money flows are balanced. A country can balance its trade either on a trading partner basis in which total money flows between two countries are equalized or it can balance the overall trade and money flows so that a trade deficit with one country is balanced by a trade surplus with another country. A discussion of how BT will create jobs and protect the environment follows.

Balanced Trade (BT) considers the nation/state as the crucial decision maker for economic policies. Within a nation/state, BT recommends a free market economy together with individual citizens' political freedom as the proven means of creating wealth and jobs. Note that under this definition entrepreneurial enterprises may be owned by individuals, corporations or government bodies so long as each such enterprise is subject to the discipline of the market.

BT recognizes that the national government must provide the infrastructure for a free market to be effective and that the government has the right to regulate entrepreneurial firms in return. Such regulations reflect the culture of the country and provide for business opportunities within the culture. Ideally such regulation provides for high worker incomes, environmental protection, subjecting all firms, whether publicly or privately owned, to the rigors of the market place, effective fiscal and monetary policies which control inflation, and so forth. The national government has the power to regulate the internal free market to reduce or eliminate environmental degradation. Thus, BT has the capacity to maximize job creation in every country while limiting environmental damage. Some will debate that national governments will do a better job of protecting the environment and that international regulation is required; it is an open question. A more complete discussion of the recommended policies is found at <http://www.mkeever.com/>.

When considering international trade, BT recommends that the nation/state regulate such commerce so that money flows into and out of the country achieve a zero balance each year. Such a government does not allow either a surplus or a deficit of money coming into or going out of the country. The primary focus is on money outflows, although excessive money inflows are also disruptive. Money flowing out of a country through excessive imports creates a lower exchange rate for its currency which makes imports more expensive to its citizens. On the other hand, money flowing into a country through excessive imports creates domestic inflation and raises the prices of its exports in the world market; both these results make its consumers worse off.

BT requires that a country import as much as it exports; it allows for and encourages the maximum amount of international trade and so it benefits both consumers and multinational companies. Consumers benefit from trade and from an increase of domestic jobs, if the economy was in a trade deficit before reducing imports. Consumers benefit even though they may pay higher prices than world prices for any particular good, their incomes are higher as a result of the higher level of economic activity – high enough to offset slightly higher prices. Consumers in countries with a surplus of exports benefit from the increased imports available to buy.

Note that this theory does not call for protection of any business. It requires only that the money flows into and out of any country remain equal. It is socially responsible because it requires the national government to ensure that capital (and jobs) does not leave the nation's borders and that an excess of imports does not occur. This keeps business capital inside the home country and encourages productive activity within the domestic economy.

BT measures trade in terms of money flows and not goods flows. This works for industrialized economies. But it is possible for a nation to have BT and still be economically out of balance. It is the national government's job to determine what additional steps are needed to protect its citizens from harmful trade. For example, I think it is unwise for a nation to rely on foreign sources for a large portion of its food supplies. A national government should protect domestic agriculture from the international market so that a steady supply of basic food is assured. Another example, some countries export raw materials and import finished goods. I think those countries should promote and protect businesses which add value to their exports wherever possible to avoid dependence on foreign suppliers for all manufactured goods and to reduce the risk of exhausting the raw material which produces its export earnings. This can be done with export taxes or licenses which require adding value in stages to the materials exported. Thus, I recommend that some of the basic concepts of strategic trade be used in less industrialized countries as a means to achieve a more stable economy.

Balancing money flows raises the question of different money flows from trade, capital transfers, FDI, borrowings and so forth that make up the Balance of Payments. I think that a country should balance its payments on current account for imports, exports, debt service and so forth and avoid financing imports with capital transfers through borrowings or foreign direct investment. Any borrowing, whether World Bank project specific or IMF structural balance of payment loans, should be treated as a loan of principal and rigidly paid back from export earnings.

The major flaw in BT is that it requires an educated and reasonably honest national government. But, the other options are more unacceptable. Corporations cannot be allowed to govern because their constituency, namely their shareholders, is too small. Citizens who do not own shares of the ruling corporation will be harmed as a matter of course. International governing bodies cannot be allowed to govern because their constituency is too large. They will be obliged to eliminate jobs in one sector of their subject area to satisfy the greater good or their influential corporate lobbyists. That will interfere with the goal of creating as many jobs as possible.

Implementing this theory is difficult even though it is simple conceptually. Here are the beginning few actions:

1. Control inflation through balanced internal fiscal policies;
2. Establish effective controls on the import and export of any capital or currencies, local or foreign; and,
3. Permit merchandise imports or capital or currency exports only when a surplus of foreign exchange exists. This can be accomplished by imposing non-tariff barriers to imports in countries which are GATT members.

The benefits of BT are

1. It's simple to understand and measure;
2. It tends to keep more jobs and business at home, thus allowing more wealth to be produced in the home country;
3. It is less likely to produce any "trade war" retaliation than other forms of trade control because the home country is simply balancing its accounts instead of retaliating over some perceived slight;
4. It allows some business interests to exert pressure while providing a theoretical basis for elected officials to resist pressure from other interests (Political pressure exists and must be managed like other trade elements. Some trade actions are restricted by treaty [GATT, etc.] making implementation more difficult.)
5. It avoids large money outflows or inflows, thus avoiding externally induced recessions or inflation; and,
6. It is easy to administer because most national governments currently keep, or can easily acquire, detailed information on the transfer of money between countries even if goods are easily smuggled. Of course, some money is smuggled into and out of countries; diligent attention can reduce that to a manageable amount.

BT also says that the economic impact of foreign trade as a share of GDP (imports plus exports as a percentage of GDP) should be managed so that the economy is neither too autarchic (missing the benefits of trade) nor too trade dependent (subjecting the local economy to international shocks). For lack of a better target, I suggest that the foreign trade impact should be about 33%; that is, imports plus exports should be about one-third of GDP. If total foreign trade exceeds one third of GDP, it means that the country is subject to harmful shocks from the external world. If total foreign trade is less than one third of GDP it means that the economy is producing and consuming less than it could with more trade. Some countries may have more foreign trade than that without harmful effects – they are lucky in that their trade is with a wide variety of stable countries. Some countries will experience shocks from loss of favorite imports as they reduce their dependence on cheap imports; they will be better off in the long run. BT requires an effective border guard system and the political will to over-rule business interests who may be harmed by reducing or expanding trade.

BT creates the most wealth inside any country because it avoids transferring wealth overseas through excessive imports and avoids excessive domestic inflation resulting from an excess of exports. This trade theory is an alternative to the efficiency theory of free trade that is not protectionist, autarchic nor promoting of trade wars: it allows for the benefits from trade while providing a mechanism to reduce trade's occasional harmful consequences. Those things which delight us and make us safe – love, family, friends, music, health, quiet, literature, drama – all benefit from higher incomes in a society. Lower incomes in any society make the enjoyment of civilization more difficult. Does the efficiency model of trade promote a "race to the bottom" whereby every country has wages and living standards equal to the lowest wage country? I think that is a real possibility. The socially responsible trade theory summarized above permits the maximum trade consistent with preservation of any home country's civilization standards. A world where each national economy has the highest possible employment consistent with that culture's values seems the best of all possible worlds.

Reader Thomas Lunde offers some insights into the mechanism by which focussing on one aspect of an economy will tend to keep other aspects in balance:

Dear Sir;

I was reading your nine page essay, Balanced Trade Toward the Future of Economics, before going to bed the other night as I was simultaneously reading a new book called Out of Control when I was presented with a similarity between the two propositions I was reading.

On Page 6 of your essay, you explain your concept of Balanced Trade as follows:

Balance trade is a simple concept which says that a country should import only as much as it exports so that trade and money flows are balanced. A country can balance its trade either on the trading partner basis in which total money flows between two countries are equalized or it can balance the overall trade and money flows so that the trade deficit with one country is balanced by a trade surplus with another country.

To achieve this balance might be an accounting procedure, but what may be more difficult to explain is how this simple accounting procedure might solve all the problems of trade between countries, while at the same time solving a host of other problems such as unemployment, environmental protection, deficits and a host of other economic and social problems that we are currently facing and which the concept of Free Trade do not seem to have effective solutions for.

The following quote gives, for me, an historical and scientific basis for your position. I hope this will prove to be of assistance in promoting your concept as it seems to me to have much merit in it's simplicity.

Respectfully

Thomas Lunde

"Out of Control: The New Biology of Machines, Social Systems, and the Economic World by Kevin Kelly "

From the Chapter "Emergence of Control" page 120

As an illustration of how the elemental loop generates precision out of imprecise parts, I follow the example suggested by the French writer Pierre de Latil in his 1956 book "Thinking by Machine." Generations of technicians working in the steel industry pre-1948 had tried unsuccessfully to produce a roll of sheet metal in a uniform thickness. They discovered about a half-dozen factors that affected the thickness of the steel grinding out the rolling-mill-such as speed of the rollers, temperature of the steel, and traction on the sheet-and spent years strenuously perfecting the regulation of each of them, and more years attempting their synchronization. To no avail. The control of one factor would unintentionally disrupt the other factors. Slowing the speed would raise the temperature; lowering the temperature would raise the production; increasing production lowers the speed, and so on. Everything was influencing everything else. The control was wrapped up in some interdependent web. When the steel rolled out too thick or too thin, chasing down the culprit out of six interrelated suspects was

inevitably a washout. These things stalled until Wiener's brilliant generalization published in "Cybernetics." Engineers around the world immediately grasped the crucial idea and installed electronic feedback devices in their mills within the following year or two.

In implementation, a feeler gauge measures the thickness of the just-made sheet metal (the output) and sends this signal back to a servomotor controlling the single variable of traction, the variable to affect the steel last, just before the rollers. By this meager, solo loop, the whole caboodle is regulated. Since all the factors are interrelated, if you can keep just one of them directly linked to the finished thickness, then you can indirectly control them all. Whether the deviation tendency comes from uneven raw metal, worn rollers, or mistakenly high temperatures doesn't matter much. What matters is that the automatic loop regulates that last variable to compensate for the other variables. If there is enough leeway (and there was) to vary the traction to make up for an overly thick source metal, or insufficiently tempered stock, or rollers contaminated with slag, then out would come consistently even sheets. Even though each factor is upsetting the others, the continuous and near instantaneous nature of the loop steers the infallible network of relationships between them toward the steady goal of a steady thickness.

The cybernetic principle the engineers discovered is a general one: if all the variables are tightly coupled, and if you can truly manipulate one of them in all its freedoms, then you can indirectly control all of them. This principle plays on the holistic nature of systems. As Latil writes, "The regulator is unconcerned with causes; it will detect the deviation and correct it. The error may even arise from a factor whose influence has never been properly determined hitherto, or even from the factor whose very existence is unexpected." How the system finds agreement at any one moment is beyond human knowing, and more importantly, not worth knowing.

The irony of this breakthrough, Latil claims, is that technologically this feedback loop was quite simple and "it could have been introduced some 15 or 20 years earlier, if the problem had been approached with a more open mind..." Greater is the irony that 20 years earlier the open mind for this view was well established in economic circles. Frederick Hayek and the influential Austrian School of Economics had dissected the attempts to trace out the route of feedback in complex networks and called the effort futile. Their argument became known as the "calculation arguments." In a command economy, such as the then embryonic top-down economy installed by Lenin in Russia, resources were all allotted by calculation, trade-offs, and controlled lines of communication. Calculating, even less controlling, the multiple feedback factors among distributed nodes in an economy was as unsuccessful as the engineer's

failure in chasing down the fleeing intertwined factors in a steel mill. In a facilitating economy it is impossible to calculate resource allotment. Instead Hayek and other Austrian economists the 1920's argued that a single variable-the price-is used to regulate all the other variables of resource allotment. That way, one doesn't care how many bars of soap are needed per person, or whether trees should be cut for houses or four books. These calculations are done in parallel, on the fly, from the bottom up, out of human control, by the interconnected network itself. Spontaneous order.