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JOURNAL OF ECONOMICS AND ECONOMIC EDUCATION RESEARCH

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LETTER FROM THE EDITOR

We are extremely pleased to present this issue of the *Journal of Economics and Economic Education Research*, an official publication of the Allied Academies' Academy of Economics and Economic Education Research, dedicated to the study, research and dissemination of information pertinent to the improvement of methodologies and effective teaching in the discipline of economics with a special emphasis on the process of economic education. The editorial board is composed primarily of directors of councils and centers for economic education affiliated with the National Council on Economic Education. This journal attempts to bridge the gap between the theoretical discipline of economics and the applied excellence relative to the teaching arts.

The Editorial Board considers two types of manuscripts for publication. First is empirical research related to the discipline of economics. The other is research oriented toward effective teaching methods and technologies in economics designed for grades kindergarten through twelve. These manuscripts are blind reviewed by the Editorial Board members with only the top programs in each category selected for publication, with an acceptance rate of less than 25%.

We are inviting papers for future editions of the *Journal for Economics and Economic Education Research* and encourage you to submit your manuscripts according to the guidelines found on the Allied Academies webpage at www.alliedacademies.org.

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ECONOMICS EDUCATION ARTICLES

MAINSTREAMING MUTUAL FUNDS

Anne Macy, West Texas A&M University

ABSTRACT

Investment techniques are a basic skill lacked by many Americans and not always taught to students. Even with the frenzy surrounding the stock market in the last decade, many educators have overlooked including basic financial economic skills in their curriculum. Mutual funds provide an easy and affordable way for many people to begin investing. The basics of mutual funds are fairly simple and can easily be incorporated into the high school and core college curriculum. This paper presents a lesson plan and ways to include mutual funds into already existing coursework. The material stresses critical thinking and using mutual funds to problem solve and meet investment goals. A main focus of the lesson is mutual fund returns and the effects of fees and taxes. This important consideration in choosing mutual funds is frequently overlooked. The lesson has active components including two simulations in order to engage the students in the decision-making process of investing.

INTRODUCTION

If we want our students to begin investing early, we need to teach them how to invest when they have limited money and experience. Educational materials on investing are usually limited to stocks and bonds. While these instruments are certainly important, mutual funds provide an important foray into investing for beginners. The automatic diversification benefits of mutual funds along with the low dollar amount needed to open an account make mutual funds the ideal choice for beginning investors.

Unfortunately, mutual funds are ignored or overlooked in many personal finance and investing books for students. The National Council on Economic Education, Jumpstart and the National Endowment for Financial

Education provide limited lessons on mutual funds. The few lessons that exist at EconEd link, Marco Polo and TheMint are elementary and don't address how to invest or what to consider (EconEd Link, 2004; MarcoPolo, 2004; TheMint, 2004). The Financial Fitness for Life series also don't provide any depth (NCEE, 2001).

University business students who take a finance class in their core curriculum receive a basic introduction to stocks and bonds but nothing other than a definition on mutual funds in the corporate finance class (Brigham and Houston, 2004; Ross, Westerfield, and Jordan, 2005; Lasher, 2005; Keown, Martin, Petty, Scott, 2005).

The lesson presented here includes the concept of mutual fund returns and the effect of fees, loads and taxes. This basic consideration in choosing a mutual fund is usually ignored or only defined in existing materials.

Many students are introduced to investing through a stock market game. While the games are engaging and provide immediate feedback for the class, they do have one major shortfall. The games promote a short-run view of the market as the students trade frequently in order to win. The games ignore the problem solving aspect of investing. Investing is a process with a future purpose or goal. Mutual funds provide a way to demonstrate using investing to meet such a goal.

In the past, students learned financial literacy from their parents. Even if this is still true, the education is lacking. A 2004 survey conducted by the JumpStart Coalition for Personal Financial Literacy found that on average high school seniors answered only 52.3% of the questions correctly (JumpStart, 2004). The poor performance of students has spurred Congress to pass the FACT Act, which creates the Financial Literacy and Education Commission, in order to promote financial literacy (U.S. Treasury Department, 2004).

CURRICULUM APPLICATION

Working with the West Texas Center for Economic Education on a conference devoted to financial economics for middle and high school teachers, it became clear that while there was a strong interest in including

the material in the curriculum, the teachers felt uncomfortable presenting the material. The teachers asked basic questions such as what is a mutual fund and how does it work. Thus, in order to incorporate more personal finance into curriculums, the teachers must be taught the material as well.

It isn't just teachers lacking this basic knowledge. Many businesses are finding that employees don't know the basics either (McCarthy and McWhirter, 2000; Quinn, 2000). This isn't surprising based on the JumpStart survey results (JumpStart, 2004). If part of effective education is preparing students to make sound decisions as employees, financial economic decisions must be part of the curriculum.

An additional issue is the time constraint faced by the secondary teachers. The teachers are confronted with a set of skills and facts that must be taught during a school year. In Texas, all material must be tied to the Texas Essential Knowledge Skills. In addition, the teachers must prepare the students for the exit exam from high school. These commitments curb the time the teachers have for including additional material. Thus, it is important to find ways to incorporate economics and personal finance into the existing curriculum. The mutual funds lesson is easily included in an economics class or a family science class. However, not all students are required to take these classes. By including a mathematics component and a history component, the lesson becomes applicable to more disciplines.

Even if teachers already included mutual funds in the material, an important part of the decision-making process was overlooked. The effect of fees and taxes on mutual fund returns was ignored. This basic factor in choosing a mutual fund was not taught and many of the teachers were unaware of its importance.

This paper presents a lesson for mainstreaming mutual funds. It includes aspects of history, mathematics, language arts along with economics. The lesson includes an extension lesson. An overview of concepts learned is also presented. While this paper focuses on the high school curriculum, the ideas and lesson are applicable to basic college courses. A goal of the lesson plan is to use mutual funds as a tool to meet investment objectives. This demonstrates for the audience the problem-solving nature of economics.

HISTORICAL PERSECTIVE

By including the historical perspective, students are able to see that mutual funds fill a demand in the economy. It also provides a cross-discipline approach to presenting mutual funds. The growth in mutual funds can be tied to the increase in personal income. The rise of suburbs and the middle class in Eisenhower administration is sometimes overlooked as the instructor hurries from World War II to Vietnam as the semester ends. The growth in disposable personal income along with the desire to save led to a demand for investment vehicles. Mutual funds became a viable choice. The term "mutual fund" was only coined in 1950 (Webster's, 1988).

By 2003, 53.3 million American households, representing 47.9% of all households, owned mutual funds. Almost $7 billion was invested in mutual funds by 2000 with households owning 80% of the total. This is more than 6.5 times the amount invested a decade earlier. Mutual funds grew in number from almost 3,000 in 1989 to just under 8,000 in 1999. Mutual funds account for 20% of retirement funds (Investment Company Institute, 2004). Table 1 shows the growth of mutual funds available to the general public. The annualized growth rate of the number of funds is 9.3%. The 1990s saw the greatest increase in mutual funds, a 10.4% annual growth rate. Per capita disposable personal income grew at 6.1% over the longer time period, less than the growth rate of funds. However, the number of accounts grew at an annualized rate of 11.85% from 1949 to 1999. This indicates that the number of accounts grew faster than disposable income and that the number of funds grew to meet the demand for mutual funds.

This simple example demonstrates how a product is developed and expanded to meet a demand. As personal income rose in the United States, the demand for mutual funds increased and was met with an increase in the supply of funds available. The students are introduced to mutual funds as a historical and current solution to a societal demand.

Table 1: Growth in Mutual Funds in the United States			
Year	Number of accounts	Number of mutual funds available to general public	Per capita disposable personal income in United States
1949	842,000	91	$1,264
1959	4,300,000	155	$1,980
1969	10,000,000	269	$3,327
1979	9,800,000	524	$7,970
1989	58,000,000	2900	$16,430
1999	228,000,000	7791	$24,220
*Numbers are rounded Data is from U.S. Department of Commerce and Investment Company Institute			

CHOOSING A GOAL

Goal setting is an important first step in investing. Mutual funds lend themselves to this discussion by the variety of funds available. This type of discussion is particularly useful in an introductory economics, family issues or mathematics class. A list of various mutual funds types in Table 2 provides a clear match of how mutual funds and the securities in which they invest are used to meet investment goals. Students can discuss what type of fund is best for which goals. For instance, which fund is better for people desiring an income flow, an aggressive growth fund or a balanced fund? The activity demonstrates the importance of defining goals and matching those goals with appropriate investment instruments.

For those students not well versed in financial economic concepts, the instructor is afforded the opportunity to include a discussion on the risk versus return relationship. A simple matching game can be used as an evaluation activity reaffirming the main concepts. After the completion of this part of the lesson, the students should understand how certain goals match with certain types of mutual funds.

Table 2: Classifications of Mutual Funds
Aggressive growth funds invest in common stocks of new companies that promise large returns, usually from high price appreciation, but entail substantial risk. The companies are usually small-capitalization firms.
Asset allocation funds invest in stocks, bonds, and money market instruments at set weights in order to earn a steady return.
Balanced funds choose among bonds, preferred stocks and common stocks in order to earn moderate growth and return.
Corporate bond funds invest in corporate bonds that provide a safe and steady flow of income.
Global funds invest primarily in stocks in the United States and foreign countries. The goal is a higher return than general domestic common stock funds.
Growth funds invest in the common stock of rapidly growing companies with the goal of high price appreciation.
Growth & income funds invest in common and preferred stocks that pay high dividends with moderate price appreciation.
High-yield bond funds invest in lower-rated, higher risk corporate bonds with a goal of higher income than traditional corporate bond funds.
Income funds invest in high-dividend paying stocks and bonds in order to earn a steady income.
Index funds invest in the same stocks that are an index in order to achieve the same return as the index.
Industry funds invest in the common stocks of companies in the same industry. These funds are also called sector or specialty funds. They offer limited diversification benefits.
International funds invest in stocks and bonds of foreign companies. The fund may specialize in specific countries or regions of the world. They do not include U.S. companies.
Money market funds invest in short-term corporate debt obligations and government bills and bonds.
Municipal bond funds invest in municipal bonds that provide tax-free interest income.
Socially responsible funds invest in stocks and bonds of corporations and governments that have beliefs and actions considered socially responsible. There is no set definition of what is considered socially responsible.

SIMULATION

A simulation is a desirable method to convey the information on choosing a mutual fund. The amounts are kept small and the time horizon short matching what students think of as a lot of money or what they have access to and what is a long time horizon. Many students have difficulty considering a thirty-year time frame. The following simulation provides students with an activity in which they can see themselves in the character. The critical thinking aspect of economics is introduced immediately. The simulation begins by considering Sally who is facing a decision, should she invest her money in a mutual fund and if so, which one.

Sally has $2,000 to invest. She is saving for a trip after graduation. Whether Sally goes to the next county to the mall or on a tour of the European countryside is a function of how well Sally invests her money. She is considering purchasing a mutual fund because she doesn't feel comfortable choosing stocks to buy on her own. With a mutual fund, investors pool their money and the portfolio manager buys stocks, bonds, and other securities selected by the analysts who work for an investment company. Sally won't have to decide which stock is better and why. Instead, the professional analysts and managers make these decisions.

Sally learns that most mutual funds are open-ended. Open-ended mutual funds are unique in that there is no specified number of shares outstanding. When an owner like Sally sells her shares, she is actually redeeming them back to the company. This means that the mutual fund is marketable, giving Sally the opportunity to sell at vacation time.

After surfing the Internet, Sally learns that diversification is an important benefit of mutual funds. Because a mutual fund owns stocks and bonds in many different companies, the risk of the portfolio is lower than the risk of each individual stock or bond. When one stock is up another will be down reducing the overall variability of the portfolio. As long as the trend is up, the portfolio will gain in value without the wild swings of an individual stock or bond. Choosing which stocks and bonds work well together and when to buy and sell is the job of the professional money manager. This

allows Sally to track her mutual funds monthly or quarterly unlike stocks, which must be followed more frequently.

Sally talks with her neighbor about the benefit of having a mutual fund manager make the decisions on buying and sell. The neighbor is an accountant and reminds Sally that each time the portfolio manager sells a stock, the tax consequences are passed on to her. Because the money manager is so important to a mutual fund, Sally knows she will have to investigate the manager and the company.

Sally discovers that many mutual funds have a reinvestment plan. A reinvestment plan allows Sally to automatically reinvest the fund's dividends and capital gains distributions into additional shares. This may be done at little or no cost. This way Sally uses the income generated from the mutual fund to buy more shares instead of having to invest more money.

Another aspect of mutual funds is fund switching. Fund switching allows Sally to switch among funds at one company when a fund no longer fits her goals or is underperforming. This can be done at a reduced or at no cost, again saving Sally money. However, Sally will still incur a tax liability. The Internal Revenue Service considers switching to be a sale and a purchase.

Sally also learns that a mutual fund's price is called the net asset value (NAV). It is determined by the net market value of the shares the fund owns. The NAV times the number of shares owned equals the value of an investor's investment.

Upon investigating mutual funds further, Sally discovers that there are funds called closed-end funds. A closed-end fund is like a mutual fund except its shares are issued by an investment company and only when the fund is organized. The fixed number of shares is then traded in a market. When an investor wants to buy shares, she must find an investor who already owns shares that wants to sell. Because the shares trade in the open marketplace, Sally is not guaranteed the stated price and may have to sell at a loss.

The most surprising thing Sally ascertains while researching mutual funds is that fund returns are dependent upon the returns of the instruments in the fund, the loads, and taxes. Because most funds in any category invest

in similar stocks, the real difference can come down to loads, fees and taxes. Sally thought that the costs of mutual funds were the same across funds and companies. Instead, they vary a lot. A load fund is a fund that charges commissions on the shares bought. A no-load fund does not charge a commission at purchase. Many funds also have a back-end load or a charge when shares are sold back to the fund. This load is also called a contingent deferred sales load.

Sally is surprised to learn that she may have to pay a fee to help pay for the advertising and marketing of her mutual fund. This additional fee is called a 12b-1 fee. The annual fee cannot exceed 8.5% of the offering price on a per-share basis. A fund that has a deferred sales charge or a 12b-1 fee of more than 0.0025% of average net assets can not be described as no-load. This is to eliminate the misuse of the term no-load. Sally is going to look for funds that have no or low load and low fees.

Sally wants a fund that won't have too high of a turnover. The buying and selling of stocks within a mutual fund is called turnover. A high turnover means that many shares were bought and sold. Sally incurs a tax obligation on each sale.

After learning all about mutual funds, Sally is considering two different mutual funds. Fund Aggressive Growth has a front-end load of 6%. It has a yearly expense ratio of 1.25%. It is expected to earn 14% per year for the next five years. Fund Basic Growth has no front-end load. It charges a yearly expense ratio of 0.75% and a 12b-1 fee of 0.15%. It is expected to earn 11.5% each year for the next five years. Both funds have a low turnover and a net asset value of $20. Expenses are incurred at the end of each year.

Sally's brother Charlie has monitored 450 portfolio managers for five years. Over the five years he has found 14 that consistently yield better returns. He concludes that these managers are superior and Sally should choose among these managers. Sally isn't so sure about Charlie's advice. Sally decides to compare the two mutual funds. She asks you to help her.

LEARNING POINTS

Table 3 provides ten questions that examine Sally's situation. The simulation teaches goal setting and the idea of allocating funds for investment. Students are exposed to matching the goal with the investment vehicle. Students further are introduced to the importance and effect of the time of an investment as they compare a two-year horizon to a five-year horizon.

A main concept is the opportunity cost of loads and fees. Some funds earn a higher return but they also charge additional loads and/or fees. The load has a greater effect the shorter the holding period. The superior mutual fund manager introduces students to basic statistics along with the practical information that a superior portfolio manager is hard to identify.

Mathematically, students calculate holding period returns. The extension questions teach the lowering effect of taxes and inflation on returns. The students determine that the return earned by the portfolio manager is different than an investor's return because of the loads, fees, and taxes. By working through the ten questions, the students discover that choosing a mutual fund involves comparing costs along with comparing returns. Table 4 shows the mathematical calculations of the returns.

Table 3: Questions and Answers to Portfolio Simulation

Questions		Answers
1.	Which of the two funds invests in stocks with higher risks?	The aggressive growth fund invests in riskier stocks.
2.	How many shares of each mutual fund can Sally purchase?	A: 94 shares [$2000/($20*0.94)] B: 100 shares ($2000/$20)
3.	What is each fund's return over the first two years?	A: 9.1% B: 10.5%
4.	What is each fund's return over five years?	A: 11.18%B: 10.5%

Table 3: Questions and Answers to Portfolio Simulation		
Questions		Answers
5.	If Sally pays a 10% tax on capital gains, what is Sally's return on each fund after five years?	A: 10.3%B: 9.62%
6.	If inflation averages 3% each year, what is Sally's real return on each fund after five years and after taxes?	A: 8.96%B: 8.33%
7.	If the Aggressive Growth fund earned 13.25% instead of 14%, would it be enough to overcome the load in five years and beat the Basic Growth fund?	No, the fund would earn 10.5%, exactly the same as the Basic Growth fund.
8.	What is the return that the portfolio manager earns on each fund over the five years? Why is it different from Sally's returns?	A: 14%B: 11.5%The portfolio manager does not have to consider loads, taxes and inflation.
9.	What is wrong with Charlie's analysis?	If each fund manager had a 50-50 chance of beating the market, over five years the chance of beating the market each of those years is 0.03125. Considering 450 portfolio managers, this means that 14 (450*0.03125) will beat the market all five years. Thus, the 14 managers will beat the market solely by chance.
10.	Which fund should Sally buy and why?	The answer depends upon whether the students think Sally should invest for two years (Basic Growth) or for five years (Aggressive Growth).
*The Aggressive Growth fund is denoted by A while the Basic Growth fund is denoted by B		

Table 4a: Mathematical steps to calculate the answers for questions 2, 3, and 4				
Aggressive Growth Fund				
Beginning amount $20 * (1-0.06) = $18.80				
Year	Beginning Amount	Grows at 14%	Expenses	Ending Amount
1	$18.80	$21.43 (18.80*1.14)	0.27(21.43*0.0125)	21.16(21.43-0.27)
2	21.16	24.12	0.30	23.82
3	23.82	27.15	0.34	26.81
4	26.81	30.56	0.38	30.18
5	30.18	34.41	0.43	33.98
Calculation of return		(End amt/ Beg amt) ^(1/number of yrs)		
Return over 2 years		($23.82/$20)^(1/2) = 9.1%		
Return over 5 years		($33.98/$20)^(1/5) = 11.18%		
Basic Growth Fund				
Beginning amount $20				
Year	Beginning Amount	Grows at 11.5%	Expenses	Ending Amount
1	$20.00	$22.30(20.00*1.115)	0.20(22.30*0.009)	22.10(22.30-0.20)
2	22.10	24.64	0.22	24.42
3	24.42	27.23	0.25	26.98
4	26.98	30.08	0.27	29.81
5	29.81	33.24	0.30	32.94
Return over 2 years		($24.42/$20)^(1/2) = 10.5%		
Return over 5 years		($32.94/$20)^(1/5) = 10.5%		

Table 4b: Mathematical steps to calculate the answers for question 5					
Effect of taxes					
Fund	Amount of capital gains	Gains taxed at 10%	Amount after taxes	Compound return	After-tax return
A	$13.98 ($33.98 - $20)	$1.40 ($13.98*0.10)	$32.58	1.629 ($32.58/$20)	10.3%
B	$12.94 ($32.94 - $20)	$1.29 ($12.94*0.10)	$31.65	1.5825 ($31.65/$20)	9.62%

Table 4c: Mathematical steps to calculate the answers for question 6	
Effect of inflation	
Inflation at 3% for 5 years	(1.03)^5 = 1.0609
Real return	(Compound return/Compound inflation) ^ (1/number of years)
Real return of Aggressive Growth	(1.629/1.0609) ^ (1/5) = 8.96%
Real return of Basic Growth	(1.5825/1.0609) ^ (1/5) = 8.33%

DESIGNING A MUTUAL FUND SIMULATION

A final activity for the students is a mutual fund creation simulation. The students devise their own mutual fund that matches a specific goal. Divide the class into five to eight teams. Give each team an investment objective for its portfolio. For eight teams, the objectives could be an aggressive growth fund, a growth fund, an income fund, a balanced fund, a growth & income fund, a bond fund, a socially responsible fund, and a global fund. To give each team an identity, have the students choose a mutual fund name to symbolize what the fund's investment philosophy is.

Give each team a set of financial information on various companies' stocks and bonds or have the teams search the Internet for the information. The students can use the Morningstar Web site (http://www.morningstar.com) to examine choices other portfolio managers who have the same goal have made. Morningstar provides independent analysis of mutual funds and much of the information available on its Internet site is free. By exploring the database, the students also can see what mutual funds charge and how they have performed. Make it clear to the students that they can't just copy what another portfolio manager has done.

Have each team make five investment choices for the portfolio. For a language arts component, each team writes a letter or makes a presentation to the shareholders of the mutual fund explaining the choices and how the choices meet the fund objective. This forces the students to refine the decision-making process that resulted in their selections. If the class has time, follow the stocks and bonds chosen for the remaining semester to see how the fictional mutual funds would have fared.

CONCLUSION

One of the most basic life skills is how to handle money. There already exist a variety of lessons and materials on consumer debt, stocks and bonds. Absent from this is list is mutual funds. This paper presents an extensive lesson on mutual funds. The lesson can be incorporated into a mathematics or history class along with the traditional economics class. Students have a desire to learn useful things. A cross-discipline approach of economics, history and mathematics ties the three together and demonstrates for the students a real world situation and solution.

After completing the lesson, the students will have been introduced to and worked with the financial economic issues of goal setting, risk and return, diversification, opportunity cost, transaction costs, taxes, and inflation. The students have used problem-solving skills to determine which mutual fund choices are appropriate for various investment goals. The students have mathematically determined returns and the effects of

transaction costs, taxes and inflation on those returns. The probability example incorporates basic statistics along with demonstrating that it is difficult to pick a superior mutual fund manager. The portfolio simulation provides the students a hands-on activity and demonstrates the difficulty in designing a portfolio. The simulation incorporates decision-making skills as the students use the Internet to search for companies in which to invest. The letter to shareholders forces the student groups to succinctly state the reasons for their choices. This helps the students clarify in their own minds the differences among mutual fund goals and the corresponding stocks and bonds included in the funds. Table 5 summarizes the decision-making process and skills covered in the lesson. Where appropriate, the National Content Standards in Economics are cited (NCEE,1997).

Table 5: Summary of decision-making process and skills covered

Action	Skill
Examine historical growth of mutual funds	Relate income to ability to invest. National Content Standard #10: Institutions evolve in market economies to help individuals and groups accomplish their goals.
Set investment goals	Define goals and how to try to meet goals.
Examine various mutual fund types	Relate the risk versus return relationship with investment goals.
Read simulation on Sally	Introduced to various terms associated with mutual funds. National Content Standard #2: Effective decision-making requires comparing the additional costs of alternatives with the additional benefits.

Table 5: Summary of decision-making process and skills covered	
Action	Skill
Calculate Sally's returns	Calculation of annualized returns - Tie in with mathematics. Understand the roles of interest rates, loads, expenses, inflation and taxes on returns. National Content Standard #12: Interest rates, adjusted for inflation, influence economic decisions.
Examine Charlie's statement	Realize that exceptional mutual funds are hard to find.
Create mutual fund	Reinforce that mutual funds are used to meet goals. Realize the difficulty in choosing investments that will provide superior performance
Written or oral presentation of mutual fund	Compels the students to succinctly convey why they selected the instruments they did choose -Tie in with language arts

Mutual funds are a viable investment option for most families. Unfortunately, there are few options for learning this material to students outside of a bachelor's program in finance. If new investors must learn the material on their own, they may not feel comfortable with their knowledge. This also may lead to an overreliance on mutual fund salespeople, brokers and advertising.

We preach to begin investing early yet we leave out the basic skills necessary to accomplish this goal. By incorporating a lesson on mutual funds into a beginning economics class, a mathematics class, a family science class or even a history class, students can learn the basics of mutual funds. For many people unfamiliar with investing, a non-threatening environment is useful for conveying the information. The simulations allow the students to

become involved in the decision-making process of investing in mutual funds and take a first step toward investing on their own.

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ECONOMICS ARTICLES

THE CONTINGENT WORKFORCE

Christopher J. Surfield, Lander University

ABSTRACT

The perceived increase in the use of contingent work arrangements, such as consulting, contracting, and temporary employment, has led to the concern of the creation of a disposable workforce. Both the employment instability and poor compensation packages thought to be associated with these work forms cause these work forms to be viewed unfavorably by many. One might wonder why workers would rationally select such employment given these concerns. Exploiting a large and nationally representative dataset, the Current Population Survey (CPS), we explore not only the prevalence of these employment arrangements, but also a worker's decision to engage in these work forms. The analysis of the 1995 to 2001 rounds of the CPS would suggest that the proportion of the United States labor force engaged in contingent employment has actually decreased. Furthermore, given that more than sixty percent of contingent workers volunteer personal reasons as to why they selected such employment the suggestion is that workers are voluntarily seeking contingent employment out.

INTRODUCTION

During the mid to late 1990s, American labor markets saw a dramatic restructuring. Increased use of flexible staffing arrangements, induced by increased global competition and changing worker preferences, has led to an increase in the popularity of such contingent work arrangements (CWAs) such as consulting, contract, and temporary work. Many do not view the increased use of CWAs, however, as being a positive economic development. The lack of both legal and wage benefits that are thought to be implied with such employment has fueled concerns of the creation of a disposable workforce within U.S. labor markets. In short, the terms "bad jobs" and

"contingent employment" have become synonymous terms in the popular media.

This paper seeks to achieve two primary goals. The first contribution made by this paper is to provide a sense of precisely what constitutes contingent employment. Although this form of employment is not a new feature of the labor market, the term "contingent" itself is still a relatively ambiguous term. The second aim of this paper is to not only quantify the role played by such employment in the American labor markets, but also to evaluate the rationale behind a worker's selection of employment in these work forms. To this end, we exploit data contained in the Current Population Survey (CPS). This dataset is particularly attractive in that not only does it have a large number of observations, but it also elicits from workers the primary reason why they chose contingent employment.

The structure of this paper is as follows. After this brief introduction, we more formally discuss the forms of employment which are commonly considered to be contingent. After the discussion of the CPS data exploited by this analysis contained in Section Three, we provide the results of our tabulations in Section Four. Concluding remarks can be found in our final section.

CONTINGENT WORK DEFINED

The underlying difference between a contingent and regular worker is in the lack of either an explicit or implicit guarantee of continued employment. Put succinctly, a contingent worker has no reasonable expectation of remaining with their employer for more than one year holding economic conditions constant. A common convention in the literature has five distinct work arrangements falling under this contingent umbrella.[1] The first four of these work arrangements are agency temporary, direct-hire temporary, oncall work, and contract work. The fifth and final work form, independent contracting/consulting work, is also considered to be contingent given that it, too, fails to offer workers any firm guarantee of continued employment.

We define agency temporary workers as those who rely on a temporary help service to secure their job-task or who received a paycheck from such an agency.[2] Direct-hire temporaries are those temporary workers who eschew this third-party's assistance and provide their services directly to the paycheck-issuing entity. Furthermore, these workers are those who indicate that they were hired directly by a firm to fill a temporary position, complete a specific job-task, or serve as a substitute for an absent or vacationing employee. Direct-hire temporaries are also those workers hired by a firm for only a fixed period of time or into positions that are seasonal in nature. Oncall workers work for a firm on a per-diem or as-needed basis. We fold day laborers into this oncall classification.

Contract workers differ from their contractors/consultant counterparts in that they, like their temporary agency counterparts, rely on a third party to provide them with the necessary clients or projects. We impose additional restrictions on this category. Namely, contract workers are those who have only one client and usually work at that client's workplace. The final CWA is contracting/consulting work. Akin to direct-hire temporaries, these workers are responsible for the acquisition of clients or projects. The key distinction between this work form and direct-hire temporaries is that former is responsible for any incurred tax liabilities, whereas the latter category relies on their client to satisfy U.S. tax laws.

Given that we have broken down the contingent workforce into five distinct categories, we include a final worker category. That is to say, we include a final category of regular workers who are found in the entire non-farm (employed) workforce. This sixth category consists of those workers who do not identify themselves as being engaged in any of the above five contingent arrangements. Put differently, this classification includes those workers who are employed in an open-ended arrangement.

DATA

The Bureau of Labor Statistics (BLS) assists research into CWAs through an ongoing supplement to the Current Population Survey (CPS) which collects data from contingent workers. Beginning in February 1995,

the Contingent and Alternative Employment Arrangement Supplement (CAEAS) to the CPS has been administered biennially. Much of the research into CWAs draws its support from this initial 1995 round of data.[3] Included in the CAEAS are data on contingent workers' arrangement preferences and the duration of their employment in CWAs. These data are complemented with the normal demographic, industrial, and occupational data contained in the basic monthly CPS. In addition to providing us with essential micro-level data, the CAEAS offers a nationally representative source of data with which we can estimate the proportion of the workforce engaged in the various CWAs.

We exploit the three subsequent rounds of the CAEAS to test the robustness of the initial 1995 findings. Our subsequent analyses are based upon data extracted from the 1995, 1997, 1999, and 2001 CAEAS. Initially, we create four distinct cross-sections using the four CAEAS surveys to ascertain the trends evident in CWA employment. Households are contained in the CPS for a maximum of sixteen months, thus there is no overlap of individuals across the four separate cohorts. Given this survey design, we can aggregate these four cross-sections into one pooled sample so as to obtain more precise estimates of the decision to engage in contingent employment.

RESULTS

There are two key findings that are obtained from our analysis of the CAEAS data. The first is that, contrary to the critics' concerns, the incidence of CWAs in the U.S. labor markets has been decreasing over the time period covered in this analysis. We obtain our second key finding from the investigation into the decision made by workers to engage in a CWA. The results of this exercise would suggest that contingent workers are voluntarily opting for employment in these work forms. We fail to find significant evidence to suggest that economic reasons are pushing workers into contracting/consulting work and, to a lesser extent, the other four CWAs. We shall now turn our attention to the penetration of contingent employment into American labor markets.

We report the distribution of workers across the various work arrangements in Table 1. Note that this table has two panels. The first, Panel A, presents the proportion of workers who we observe as holding employment in one of the five CWAs or who are employed in an open-ended (regular) employment arrangement. The second panel presents tabulations of the total number of individuals who are employed during the months covered in this analysis. Multiplying the proportions contained in Panel A by the total non-farm employment statistics highlighted in Panel B allows us to estimate the total number of workers who are engaged in the various work forms.

Although agency temporaries receive much of the popular media's attention,[4] this employment arrangement accounts for less than one percent of total non-farm employment in the United States. That is to say, approximately one million workers, out of one hundred and thirty-two million, were observed as being an agency temporary in 2001. In contrast, their direct-hire counterparts are far more numerous. This CWA employs approximately six percent of all American workers. Thus, we estimate that approximately 8.5 million workers received their paychecks from direct-hire temping in 2001. Oncall work accounts for slightly more of the workforce than does agency temping. In 2001, slightly fewer than two percent of all workers, or 2.2 million workers, can be found working as an oncall or day laborer.

Those who rely on a contract firm to secure their job-tasks comprised the smallest work form in the U.S. In 2001, less than one-half of one percent of all workers, or approximately 0.7 million workers, earned their living via contract employment. Across all four cross sections the most common CWA is (independent) consulting and contracting work as more than 8.5 million workers were engaged in such employment during 2001. This finding that consulting and contracting employment constitutes the most pervasive CWA holds across all four of our cross-sections.

Table 1: Contingent Work Arrangements and Employment in the United States

A. Contingent Work Arrangements	February 1995	February 1997	February 1999	February 2001
Regular workers	84.5%	85.1%	85.6%	85.0%
Agency temporaries	1.0%	1.0%	0.9%	0.9%
Direct-hire temporaries	6.6%	5.8%	5.8%	6.4%
Oncall workers	1.7%	1.6%	1.7%	1.7%
Contract workers	0.5%	0.6%	0.6%	0.5%
Contractors and consultants	6.7%	6.7%	6.3%	6.4%
n	57,908	51,805	52,461	38,843
B. Total Non-Farm Employment	116.5	121.4	127.9	132.4

Note: Total Non-Farm Employment is reported in millions.

For contingent (regular) workers, there was a downward (upward) trend in the employment proportions over the 1995-99 time period. The proportion of workers engaged in contingent employment did slightly increase in 2001. Agency temping and oncall work remained virtually unchanged over the entire period examined. Both direct-hire temping and contracting/consulting, the two largest CWAs, saw their shares of the U.S. workforce decline from 1995 to 1999, albeit with slight up ticks in 2001. Their increased shares of the workforce in 2001, it should be noted, are statistically significant.[5] This up tick did not offset the decline experienced in the 1995 to 1999 time period. The overall reduction in the proportion of the workforce engaged in a CWA from 1995 to 2001 is itself statistically significant.

These results presented above appear to lend little support for the critics' concern of the creation of a disposable workforce. One of the key criticisms attaching to the use of contingent employment by firms is the

perceived incentive to transfer large numbers of (regular) workers onto the contingent payroll so as to save on wage and benefit expenses. This concern is not supported by the results we highlight in Table 1. These tabulations lead to one controversial conclusion: the use of CWAs by firms and workers significantly decreased over the period of time covered by our data. An examination of the reasons provided by workers as to why they selected contingent employment also provides little support for the fears that firms are using CWAs to circumvent labor protection laws.[6]

Given the negative implications that contingent employment is thought to hold for both worker earnings and employment stability, one might why a worker would opt for such employment. The CAEAS attempts to provide us with an answer to this question through the inclusion of questions for selected preference measures. For example, contingent workers are asked to select from a predetermined list the primary reason as to why they are in their current employment arrangement. Subsequent questions ask if a worker engaged in a CWA would prefer another arrangement, might prefer a different arrangement, or if they are satisfied with their current work arrangement. Finally, the CAEAS also includes data which allow us to determine approximately how long (in years) a worker has been employed in his or her respective work arrangement.[7]

The cross-tabulations obtained from the analysis of these data are highlighted in Table 2. Note that this table has three panels. The first contains the tabulations of the primary reasons provided by contingent workers for their choosing employment in their particular CWA. Panel B presents the results that are obtained from the worker preference questions. One complication attaching to our analysis in these panels is that data for contract workers are unavailable from the CAEAS.

Our final panel evaluates the 'Time in Arrangement' that has elapsed from the time a worker entered in contingent employment until the administration of the appropriate (February) CAEAS. This 'Time in Arrangement' variable does differ across the various CWAs. For agency temporaries, it is the number of years in which a worker has been accepting assignments from a temporary agency. Thus, this variable should not be viewed as being the number of years that an agency temporary has been with

a particular client. With direct-hire and oncall workers, this variable does explicitly represents the number of years these workers have been with their current employer at the time of survey. In these cases, the employers are also the workers' client firms. Similar to agency temporaries, contract workers are asked how long they have been in their arrangement. Unfortunately, comparable questions are not administered to those who are engaged in contracting/consulting work.

A second measure of arrangement duration is constructed through a dichotomous variable equal to one if a worker has been in that arrangement for a year or more (zero otherwise). To be precise, they are asked if whether they have been working in their present arrangement for at least one year or more. Sample sizes are not reported in Panel C because those workers who fail to respond to the continuous duration variable are asked a follow-up question. One additional caveat is attached to the results that are contained in Panel C. All durations are right censored, as we know only the time spent in the current CWA up and until the worker's CAEAS interview. These durations should be not viewed as completed spells of contingent employment.

Table 2: By Employment Arrangement, Selected Preference Measures

A. Reasons for Employment	Agency temporaries	Direct-Hire temporaries	Oncall workers	Contract workers Contractors/ consultants
Fired, rehired temporary	0.02	0.01	0.01	0.01
Only work could find	0.34	0.16	0.25	0.03
Hope leads to permanent	0.17	0.07	0.06	0.01
Money is better	0.02	0.02	0.02	0.19
Other economic	0.06	0.06	0.07	0.05

Table 2: By Employment Arrangement, Selected Preference Measures				
A. Reasons for Employment	Agency temporaries	Direct-Hire temporaries	Oncall workers	Contract workers Contractors/ consultants
Total Economic Reasons	0.61	0.32	0.41	0.29
Enjoy flexibility	0.17	0.11	0.24	0.24
Childcare difficulties	0.00	0.01	0.01	0.02
Other family obligations	0.03	0.04	0.04	0.03
Schooling obligations	0.03	0.31	0.07	0.01
Gain experience/ training	0.02	0.03	0.00	0.03
Prefer short-term	0.02	0.03	0.01	0.27
Other personal	0.12	0.16	0.20	0.13
Total Personal Reasons	0.39	0.68	0.58	0.72
B. Preferences				
Prefer another arr.	0.59	0.52	0.51	0.09
Maybe prefer another arr.	0.06	0.04	0.05	0.05
Satisfied with current arr.	0.35	0.44	0.44	0.86
C. Duration				
Time in arrange-ment (in years)	1.36	2.49	3.81	3.68
Percent engaged in arr. > 1 year	43%	75%	63%	69%

Consistent with the preliminary 1995 research,[8] we find that agency temporaries emerge as the most dissatisfied with their employment arrangements among contingent workers. The tabulations contained in Panel A would suggest that the majority of these workers would prefer employment in any other arrangement than agency temporary work. Although sixty percent of agency temps indicate that any other work form would be preferable to their current employment arrangement, the suggestion is not all agency temps are involuntarily engaged in such work. Personal or flexibility needs encouraged approximately forty percent of these workers to enter into this arrangement. Further undercutting the concerns of the critics, only two percent of agency temporaries indicate that their (open-ended) position was eliminated and that they were rehired as a temporary worker. This reason was also an unimportant consideration across the other three work arrangements for which we have complete data. It should still be noted that a substantial number of agency temporary and oncall workers indicate that their employment arrangements were the only forms of work that they could secure. A similar finding is obtained, although to a lesser extent, among direct-hire temporaries.

At the other end of the preference spectrum are consulting and contracting workers. These workers are overwhelmingly happy with their current work form. Fewer than ten percent of contractors/consultants indicate that they would prefer to work in an arrangement other than consulting or contracting. These workers are particularly pleased with the flexibility in scheduling permitted by this work form or would prefer to have employment that is short-term in nature. One key benefit that has always been associated with consulting or contracting work has been the ability that an individual has to accept or decline potential clients or project on the basis of the worker's judgment of desirability.

Located in Panel C of Table 2 is information on the amount of time that workers have spent in their respective CWAs. It would appear that temporary work is, in fact, temporary. Only forty percent of agency temps spend more than one year in this arrangement. Direct-hire temporary, oncall, and contract workers do experience slightly longer durations than agency temps. On average, agency temps spend about 1.3 years accepting

assignments from a temporary agency. The longest time spent in a CWA is that associated with oncall work as the average worker spends 3.8 years in this work form.[9]

If a worker's need for flexibility in scheduling work hours plays a key role in the decision to engage in contingent employment, we might wish to examine the employment decisions made by a group of workers who might truly desire this flexibility. The data contained in the basic CPS allows us to identify those (employed) workers who are concurrently enrolled in school. These competing demands for an individual's time may make employment in a CWA particularly desirable. Note that only those individuals aged sixteen to twenty-four are asked if they are enrolled in an educational institution. Those employed workers who may be enrolled in school, yet are older than twenty-four, are unobserved to us. This may introduce a degree of bias into our investigation into the employment decisions made by all workers who are actually observed as being enrolled in school.

Table 3: Employment Choices of Workers Enrolled in School

	February 1995	February 1997	February 1999	February 2001
Agency temporaries	1.0%	1.0%	1.0%	1.0%
Direct-hire temporaries	17.0%	18.0%	19.0%	1.0%
Oncall workers	3.0%	3.0%	3.0%	3.0%
Contract workers	0.0%	0.0%	1.0%	0.0%
Contractors/consultants	2.0%	1.0%	2.0%	1.0%
n	3,320	2,984	3,092	2,276

We present the findings obtained using this sub-sample in Table 3. That is to say, we present in this table those employment arrangements selected by workers who are also enrolled in school. Across all four rounds

of the CAEAS, we discern one clear trend: direct-hire temping is clearly the employment arrangement of choice for this sub-group. Nearly twenty percent of all workers who are also seeking an education can be found earning their paycheck via this work form. It should be noted that these workers are significantly less likely to be engaged in open-ended employment when compared to the general workforce.

CONCLUDING REMARKS

The results obtained from our CAEAS data fail to provide any support for the notion that contingent work arrangements are trapping workers into an unstable future. In fact, quite the opposite is occurring. Our 1995 results would suggest that the upper bound of the estimated proportion of the workforce employed in a CWA to be around sixteen percent. The percentage of the workforce observed as being a contingent worker significantly declined by one percentage point to account for fifteen percent of the total non-farm employment in 2001.

Furthermore, although contingent worker may indicate that they would prefer employment in a different work arrangement, it would appear that personal or scheduling needs are encouraging them to voluntarily select their work forms. This finding is particularly strong for those employed in contracting and consulting given that fewer than ten percent of such workers would prefer to have other types of employment. For the other contingent work forms, it may initially appear to these employment arrangements are not the worker's preferred choice, but are still being voluntarily selected. The majority of contingent workers provide personal reasons as to why they opted for their employment arrangement. In summary, our results fail to provide any support to the concern that CWAs foster the creation of a disposable workforce in the United States or that workers are being trapped in these work forms.

ENDNOTES

1 A series of *Monthly Labor Review* articles in the March 1996 discuss the two possible methods of identifying contingent workers. For comparability, I adopt the method that distinguishes workers on the basis of their work arrangement as put forth by Cohany (1996), Hipple and Stewart (1996) and Polivka (1996a, 1996b).

2 This last condition leads to the inclusion of the miniscule fraction of an agency's workers who are engaged in regular employment and are paid by a temporary agency. As noted in Houseman and Polivka (1999), the 1989 *Industry Wage Survey* would indicate that such workers comprise only 3.2% of a temporary agency's total workforce.

3 A review of the initial research into CWAs can be found in the series of articles published in the March 1996 edition of the *Monthly Labor Review*.

4 For example, the April 21, 2002 edition of the *New York Times* proclaimed the nation to be heading into a recession given a ten percent reduction in payrolls of temporary agencies.

5 A paired t-test was used to determine significance at the five percent level.

6 For further discussion of the negative implications that contingent work holds for a worker's employment protections, see Hylton (1996), Lee (1996), and Nollen (1996).

7 It is possible to identify the time an agency temporary spent with the client for which he or she worked at the time of the CAEAS/CPS interview. This measure, however, would not have measured the time a worker has been engaged in this work form in a comparable manner as the other work arrangements.

8 c.f. Polivka (1996c).

9 As noted, the tabulations are undertaken using censored data. A more rigorous treatment of the data using duration estimation techniques is necessary and a possible future research activity.

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THE MONETARY APPROACH TO BALANCE OF PAYMENTS: A REVIEW OF THE SEMINAL LONG-RUN EMPIRICAL RESEARCH

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ABSTRACT

This paper provides a review of the seminal long-run empirical research on the monetary approach to the balance of payments with a comprehensive reference guide to the literature. The paper reviews the three major alternative theories of balance of payments adjustments. These theories are the elasticities and absorption approaches (associated with Keynesian theory), and the monetary approach. In the elasticities and absorption approaches the focus of attention is on the trade balance with unemployed resources. In the monetary approach, on the other hand, the focus of attention is on the balance of payments (or the money account) with full employment. The monetary approach emphasizes the role of the demand for and supply of money in the economy. The paper focuses on the monetary approach to balance of payments and reviews the seminal long-run empirical work on the monetary approach to balance of payments. Throughout, the paper provides a comprehensive set of references corresponding to each point discussed. Together, these references exhaust the existing long-run research on the monetary approach to balance of payments.

INTRODUCTION

This paper provides a review of the seminal long-run empirical research on the monetary approach to the balance of payments with a comprehensive reference guide to the literature. The paper reviews the three major alternative theories of balance of payments adjustments. These theories

are the elasticities and absorption approaches (associated with Keynesian theory), and the monetary approach. In the elasticities and absorption approaches the focus of attention is on the trade balance with unemployed resources. The elasticities approach emphasizes the role of the relative prices (or exchange rate) in balance of payments adjustments by considering imports and exports as being dependent on relative prices (through the exchange rate). The absorption approach emphasizes the role of income (or expenditure) in balance of payments adjustments by considering the change in expenditure relative to income resulting from a change in exports and/or imports. In the monetary approach, on the other hand, the focus of attention is on the balance of payments (or the money account) with full employment. The monetary approach emphasizes the role of the demand for and supply of money in the economy. The paper focuses on the monetary approach to balance of payments and reviews the seminal long-run empirical work on the monetary approach to balance of payments. Throughout, the paper provides a comprehensive set of references corresponding to each point discussed. Together, these references exhaust the existing long-run research on the monetary approach to balance of payments.

This study is organized in the following way: First it reviews three alternative theories of balance of payments adjustments. They are the elasticities and absorption approaches (associated with Keynesian theory), and the monetary approach. Then, the seminal long-run empirical work on the monetary approach is reviewed. It notes that the literature may be divided into two classes, long run (associated with Johnson) and short run (associated with Prais). Then, the review focuses on the seminal long-run literature. The theoretical model is described first, and then the estimated results are reported. At the end of the discussion, some of the shortcomings of the long-run approach and possible ways to reduce these shortcomings are pointed out.

DIFFERENT APPROACHES TO THE BALANCE OF PAYMENT ANALYSIS

Three alternative theories of balance of payments adjustment are briefly reviewed in this section. They are commonly known as the elasticities, absorption, and monetary approaches. Ardalan (2003) provides a more complete review of these three theories and reviews the short-run empirical work on the monetary approach to balance of payments. The current paper avoids repeating the references which already appear in Ardalan (2003).

The elasticities approach applies the Marshallian analysis of elasticities of supply and demand for individual commodities to the analysis of exports and imports as a whole. It is spelled out by Joan Robinson (1950).

Robinson was mainly concerned with the conditions under which devaluation of a currency would lead to an improvement in the balance of trade. Suppose the trade balance equation is written as:

X = value of exports
IM = value of imports
BT = balance of trade

$$BT = X - IM \qquad (1)$$

In this context, it is generally assumed that exports depend on the price of exports, and imports depend on the price of imports. These relations are then translated into elasticities, by differentiating the above equation with respect to the exchange rate. A criterion for a change of the balance of trade in the desired direction can be established, assuming that export and import prices adjust to equate the demand for and supply of exports and imports.

The effect of a devaluation on the trade balance depends on four elasticities: the foreign elasticity of demand for exports, and the home elasticity of supply, the foreign elasticity of supply of imports, and the home elasticity of demand for imports. For the special case where it is assumed that the trade balance is initially zero and that the two supply schedules are

infinitely elastic, the elasticities condition for the impact of a devaluation to be an improvement in the trade balance, is that the sum of the demand elasticities exceed unity. This has been termed the "Marshall-Lerner condition."

A notable shortcoming of the elasticities analysis is its neglect of capital flows. Even though the adherents of the elasticities approach were attempting to guide the policy-maker in improving the country's balance of payments, their focus, nevertheless, was on the balance of trade (net exports of goods and services).

The absorption approach was first presented by Alexander (1952). He sought to look at the balance of trade from the point of view of national income accounting:

Y = domestic production of goods and services
E = domestic absorption of goods and services, or domestic total expenditure
BT = balance of trade

$$BT = Y - E \qquad (2)$$

The above identity is useful in pointing out that an improvement in the balance of trade calls for an increase in production relative to absorption.

When unemployed resources exist, the following mechanism is visualized: the effect of a devaluation is to increase exports and decrease imports. This in turn causes an increase in production (income) through the multiplier mechanism. If total expenditure rises by a smaller amount, there will be an improvement in the balance of trade. Thus, the balance is set to be identical with the real hoarding of the economy, which is the difference between total production and total absorption of goods and services, and therefore equal to the accumulation of securities and/or money balances. In the presence of unemployment, therefore, devaluation not only aids the balance of payments, but also helps the economy move towards full employment and is, therefore, doubly attractive.

The absorption approach can be said to work only in the presence of unemployed resources. The absorption approach is a significant improvement

over the elasticities approach in one important sense, this is its view of the external balance via national income accounting. In this manner, the approach relates the balance to the happenings elsewhere in the economy rather than taking the partial equilibrium view of the elasticities approach in analyzing the external sector in isolation.

The elasticities and absorption approaches are concerned with the balance of trade while the monetary approach concerns itself with the deficit on monetary account. In principle, this balance consists of the items that affect the domestic monetary base.

The monetary approach, like the absorption approach, stresses the need for reducing domestic expenditure relative to income, in order to eliminate a deficit in the balance of payments. However, whereas the absorption approach looks at the relationship between real output and expenditure on goods, the monetary approach concentrates on deficient or excess nominal demand for goods and securities, and the resulting accumulation or decumulation of money.

The monetary approach looks at the balance of payments as the change in the monetary base less the change in the domestic component:

H = change in the quantity of money demanded
D = domestic credit creation

$$BP = DH - DD \qquad (3)$$

where the "italic D," i.e., *D*, appearing in front of a variable designates the "change" in that variable. That is, *D* is the first difference operator: $DX = X_{(t)} - X_{(t-1)}$.

Putting just monetary assets rather than all assets "below the line" contributes to the simplicity of the monetary approach. Other things being equal, growth in demand for money, and of factors that affect it positively should lead to a surplus in the balance of payments. Growth in domestic money, other things being equal, should worsen it. Thus, the growth of real output in a country with constant interest rates causes its residents to demand a growing stock of real and nominal cash balances. This means that the

country will run a surplus in the balance of payments. In order to avoid a payments surplus, the increase in money must be satisfied through domestic open market operations. To produce a deficit, domestic money stock must grow faster than the growth of real income.

This analysis suggests that if a country is running a deficit, then assuming that the economy is growing at its full-employment growth rate with a given rate of technological progress, it should curtail its rate of domestic monetary expansion. Use of other measures like the imposition of tariffs, devaluation or deflation of aggregate demand by fiscal policy can succeed only in the short run.

REVIEW OF THE SEMINAL LONG-RUN EMPIRICAL RESEARCH

Empirical work on the monetary approach to the balance of payments can be divided into two different approaches; one tests the theory in long-run equilibrium, the other considers the adjustment mechanism and the channels through which equilibrium is reached. The first approach is based on the reserve flow equation developed by H. G. Johnson (1972). Testing was undertaken by J.R. Zecher (1974) and others. The second approach is based on theoretical work of S.J. Prais (1961), with corresponding empirical work undertaken by R.R. Rhomberg (1977) and others. In this paper, seminal long-run approach is reviewed by representing the underlying theoretical model first, and then looking at a few well-known empirical estimations of the model.

First, this section introduces the reserve flow equation and two methods that can be used to evaluate the theory. Next, three representative and well-known tests are reviewed. Last, some of the shortcomings of this long-run approach are discussed and ways to reduce them are pointed out. For a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation" see appendix 1. For a comprehensive list of references which have estimated the "capital flow equation," which is a variant of the "reserve flow equation," see appendix 2.

At this point it is appropriate to note that in the long run there is no unemployment and no arbitrage opportunities exist; i.e., full-employment output is exogenous, and prices and interest rates are equal across countries. Since most of the literature considers small countries, prices and interest rates are, therefore, determined exogenously in the world commodity and capital markets.

Johnson's Theoretical Formulation and Its Empirical Implications

The reserve flow equation is associated with H.G. Johnson (1972). For a small country with a fixed exchange rate, the equation can be derived by the following system: The demand for money, equation (4), is dependent on the foreign and domestic price level, P, real income, Y, and the nominal interest rate, i. The supply of money, equation (5), is dependent on the magnitude of the money multiplier, m, and the sum of international, R, and domestic, D, assets of the central bank. Equation (6) specifies equilibrium in the money market.

$$M^d = P.L(Y,i) \quad (4)$$
$$M^s = m.(R+D) \quad (5)$$
$$M^d = m.(R+D) \quad (6)$$

In stationary steady state, this model implies that the balance of payments is zero. In order to obtain non-zero reserve flows, the model is reformulated in terms of steady state "growth." Letting "g" denote the percentage growth rate of a variable, i.e., $g_x = (1/x)(dx/dt)$, equation (6) implies the following equations:

$$g_{Md} = g_m + g_{(R+D)} \quad (7)$$
$$g_{Md} = g_m+[R/(R+D)].g_R+[D/(R+D)].g_D \quad (8)$$

Letting e_x signify elasticity of money demand with respect to x, the demand for money in growth terms is:

$$g_{Md} = g_P + e_Y.g_Y + e_i.g_i \quad (9)$$

Combining equations (8) and (9) with the equilibrium condition yields:

$$g_P + e_Y.g_Y + e_i.g_i = g_m + [R/(R+D)].g_R + [D/(R+D)].g_D \quad (10)$$
$$[R/(R+D)].g_R = g_P + e_Y.g_Y + e_i.g_i - g_m - [D/(R+D)].g_D \quad (11)$$

Equation (11) is the reserve flow equation developed by Johnson (1972). It is the foundation for almost all long-run analysis.

Ordinary least squares can be applied to the reserve flow equation if the following conditions hold; there is no sterilization of reserve changes, and real income, prices, and interest rates are exogenous. Given the earlier assumptions, all of these conditions must hold for a small country with a fixed exchange rate. In this model the domestic monetary authorities have no control over any real or nominal variables in the economy except the domestic component, D, of high-powered money, and, through reserve flows, international reserves. See Magee (1976).

Bijan Aghevli and Mohsin Khan (1977) point out that in utilizing the reserve flow equation, one can use basically two methods. For a comprehensive list of references which have applied either of the two methods see appendix 3. One method is to estimate the reserve flow equation directly, and then check the signs and values of the estimated coefficients. For a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation" and have discussed signs and values of the coefficients in the context of the monetary approach to balance of payments see appendix 4. For a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation" and have not only discussed signs and values of the coefficients in the context of the monetary approach to balance of payments but also contrasted them with those as expected by the Keynesian approach see appendix 5. For a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation" and have not only discussed signs and values of the coefficients in the context of the monetary approach to balance of

payments and contrasted them with those as expected by the Keynesian approach but also explicitly decided in favor of one theory or the other see appendix 6. The other is to estimate a demand for money function and substitute it into the reserve flow equation. Simulated values from this equation then can be compared with actual values to test the tracking ability of the model. For a comprehensive list of references which have applied this second method see appendix 7.

Using the first method, one has to know what signs and magnitudes to expect for the estimates of coefficients. The coefficient for g_Y is e_Y, the income elasticity of demand for money. It should be positive and in the neighborhood of unity. For given interest rates, price levels, money multiplier, and domestic credit, growth in income generates an increased demand for money, and a reserve inflow just sufficient to result in an increase in the nominal and real money stock. This result conflicts with the simple Keynesian model in which rising income increases imports and presumably generates a reserve outflow.

The coefficient for g_i is the interest elasticity of the demand for money, which is negative. Increases in the interest rate are associated with reserve outflows in this hypothesis. The interest rate is viewed as a proxy for world interest rates, and changes in this interest rate are taken to reflect similar movements in rates around the world. Given foreign price levels, an increase in interest rates reduces the demand for money and generates reserve losses.

The coefficient for g_P is unity because the elasticity of money demand with respect to the price level is unity. Domestic and world prices are assumed to be equal. As a result, price changes have a positive effect on reserve flows. An increase in prices reduces real money balances (increases demand for nominal balances) and, other things being equal, leads to a reserve inflow just sufficient to restore real money balances to their previous level.

The final two variables reflect domestic influences on the money stock, and both variables are responsive to policy actions by the monetary authorities. An increase in either variable tends to increase the stock of money and, other things being equal, should lead to an outflow of reserves

sufficient to restore the real money stock to its previous level. See Zecher (1974). As a result, the coefficient for g_m must be unity while the coefficient for g_D depends on the relative importance of domestic assets in the central bank's portfolio, i.e., [D/(R+D)].

Before turning to the empirical work on this approach, the following point should be made clear. The data used to measure changes in international reserves does not correspond exactly to the theoretical concept. The balance of payments measure in the monetary theory shows the effect of a deficit or surplus on the monetary base. In the case of the United States, the deficit or surplus is composed of: (a) changes in U.S. holdings of gold, convertible foreign currencies, and monetized Special Drawing Rights (with positive changes increasing the monetary base), and (b) changes in foreign deposits at the Federal Reserve Bank (with positive changes decreasing the monetary base).

The nearest, although imperfect, approximation to this measure in most official statistics is the Official Settlements concept of a deficit or surplus, or the very similar balance on Official Reserves Transactions. The major difference between these measures and the balance affecting the monetary base is that the official measures include changes in foreign official holdings of U.S. securities and commercial bank deposits in the United States.

Empirical testing of the monetary approach invariably uses the Official Settlements concept of the imbalance rather than the monetary base, because the latter concept is relatively new and, except for the United States, is not generally published in official statistics. Since most models developed to test the monetary approach pertain to countries other than the United States, in practice, the only recorded balance of payments measure that resembles a balance on the monetary account is the Official Settlements. The studies reviewed here, therefore, use the Official Settlement concept. See Kreinin and Officer (1978). The difference between the two measures is minimal or non-existent for small countries, especially under-developed ones.

Zecher's Results

The most frequently cited empirical work in the long-run literature is Richard Zecher (1974). Zecher (1974) estimates the reserve flow equation for Australia, using quarterly data for the period 1951-II through 1971-I, and annual data between 1951 and 1971. His results are reported in Table 1.

Table 1: Zecher: Reserve Flow Equations

Quarterly:

$$(R/R+D).g_R = 1.11\ g_Y - 0.035\ g_P + 0.65\ g_i - 0.89\ g_m - 1.06\ (D/R+D).g_D$$
$$(6.54)\quad (-1.08)\quad (3.70)\quad (-12.77)\quad (-20.92)$$

adjusted R-squared = 0.89 D-W = 1.69

Annual:

$$(R/R+D).g_R = 0.92\ g_Y - 0.11\ g_P + 1.38\ g_i - 1.14\ g_m - 1.23\ (D/R+D).g_D$$
$$(3.54)\quad (-0.75)\quad (2.56)\quad (-5.08)\quad (-7.97)$$

adjusted R-squared = 0.93 D-W = 2.13

The numbers in parenthesis are t-statistics.

Zecher's (1974) estimates, in both cases, support the monetary approach. The estimated coefficients of g_P, g_m, and $[D/(R+D)].g_D$ for the quarterly observations are all within two standard errors of their hypothesized values of +1 and -1. The coefficient for interest rates is negative, but not significant.

These results suggest that the Australian experience over the period 1950-71 has been consistent with the monetary approach to the balance of payments. The novel implications that both economic growth and increases in the price level lead to surpluses are supported by the evidence. The implication that rises in domestic interest rates lead to deficits, while not finding strong support, is consistent with the results of these regressions. Finally, the two variables reflecting domestic influences on the money stock,

g_m and $[D/(R+D)].g_m$, appear to have dependable, negative effects on reserve flows.

Wilford and Wilford's Results

Sykes Wilford and Walton Wilford (1978) examine the Honduran case. They estimate a reserve flow equation using annual data for the period 1950-1974, and quarterly data from 1966-IV to 1974-IV. Their results are reported in Table 2, respectively.

Table 2: Wilford and Wilford: Reserve Flow Equations

Annual:

$$(R/R+D).g_R = 1.11\ g_Y - 0.16\ g_i + 1.12\ g_P - 0.94\ g_m - 0.88\ (D/R+D).g_D$$
$$(4.09)\quad (-2.01)\quad (3.61)\quad (-3.47)\quad (-6.76)$$

R-squared = 0.81 D-W = 2.46

Quarterly:

$$(R/R+D).g_R = 1.155\ g_Y - 0.059\ g_i - 0.135\ g_P - 0.531\ g_m - 0.901\ (D/R+D).g_D$$
$$(2.011)\quad (-0.567)\quad (-0.779)\quad (-2.226)\quad (-9.372)$$

R-squared = 0.76 D-W = 2.04

The numbers in parenthesis are t-statistics.

When annual data are used, coefficients are significantly different from zero, have the appropriate signs and are not statistically different from their hypothesized values at the 5 percent level of significance. Results using quarterly data are not as strong as those using annual data. The coefficient for g_P is negative, but not significant and the coefficient for g_m is negative and significant, but well below one. Given the short-run nature of this data, the weaker results are not surprising.

Aghevli and Khan's Results

Bijan Aghevli and Mohsin Khan (1977) use cross-sectional data to estimate both a demand for money and reserve flow equation for 39 developing countries. After checking the signs and values of coefficients for money demand they are substituted into a reserve flow equation. Then, the simulated and actual values of the change in reserves are compared. The estimated money demand and reserve flow equations are reported in Table 3.

Table 3: Aghevli and Khan: Money Demand and Reserve Flow Equations

Money Demand:

$$g_M = -3.8100 + 0.2611\ g_P - 2.3575\ g_Y - 0.1142\ g_{IP}$$
$$(-1.22)\quad (2.19)\quad (4.20)\quad (-1.03)$$

adjusted R-squared = 0.3374

Reserve Flow Equation:

$$(R/R+D).g_R = -4.2476 + 0.2569\ g_P + 1.0276\ g_Y - 0.1214\ g_{IP} - 0.1452\ g_m - 0.4150\ (D/R+D)g_D$$
$$(-2.74)\quad (3.39)\quad (3.67)\quad (-2.00)\quad (-0.58)\quad (-6.62)$$

adjusted R-squared = 0.6244

The numbers in parenthesis are t-statistics.

The demand for real money balances is specified as a function of real income and the rate of inflation, where IP is defined as (1/P)(dP/dt). In those countries where interest rates are available, they are not very meaningful because they tend to be constant over substantial time periods. Results reject homogeneity in prices. The coefficient of the rate of growth in prices is significantly less than unity. What confidence should be placed in this result is uncertain. The coefficient for the rate of growth in inflation also is not significantly different from zero and this may be due to multi-collinearity between the level and rate of change in inflation. The size of the income

elasticity of demand for money is too large. Aghevli and Khan argue that this is to be expected for developing economies since the public holds most of its savings in money form owing to the absence of alternative financial assets. In so far as savings increase more than proportionately with economic growth, the estimated income elasticity will exceed unity. The general fit of the equation as measured by the coefficient of determination is poor, but that is not unusual for cross-sectional data.

The estimate of the reserve flow equation shows that all estimated coefficients have the expected signs, and, apart from the coefficient of the rate of growth in the money multiplier, all are significantly different from zero, at least at the 5 percent level. The coefficient of the rate of inflation is substantially less than unity, indicating a high degree of money illusion in the demand for nominal money balances. The income coefficient is now much closer to what would be expected, as its value is not significantly different from unity. The estimated coefficient of the rate of growth in domestic assets held by the central bank is significantly different from unity. This implies that all increases in this variable will not leak out in the balance of payments. Perhaps this is so because some of the assumptions behind the theory are not satisfied. If an open market operation leads to a change in either prices or real income, and thereby changes the public's demand for money, the effect on the balance of payments will be reduced. The fit of the equation is much better than is obtained for the demand for money, with more than 60 percent of the variation of the dependent variable being captured by this specification.

The money demand equation which is estimated above is substituted in a reserve flow equation and the actual and predicted values of reserve flows are then compared. The model does not do very well as the correlation coefficient between actual and predicted values is 0.7659.

Comments on the Long-Run Approach

As mentioned at the beginning of this section, ordinary least squares can be applied to the reserve flow equation if there are no sterilization

operations, and real income, prices, and interest rates are all exogenous. See Magee (1976). A few comments on these assumptions are in order.

a. *Sterilization*: The reserve flow equation cannot be used if the central bank sterilizes reserve flows. Sterilization leads to biased estimates of the coefficients of the reserve flow equation. If there is an exogenous increase in the home demand for money caused, for example, by an increase in world, and hence, domestic prices, then reserves flow in. If the monetary authorities sterilize even partially, they sell domestic assets as they buy foreign exchanges, generating an inverse relation between g_R and g_D. As a result, if we cannot exclude the possibility of sterilization, the coefficient for $[D/(R+D)].g_D$ will be biased toward unity and yields little or no support for the monetary approach. See Darby (1980).

b. *Exchange Rate*: The estimates of the coefficients in the reserve flow equation will not be as expected if some demand variables are excluded from the reserve flow equation. For example, an increase in domestic credit will lead to a depreciation of the (excluded) foreign exchange rate when the latter is within the band set by the exchange authorities. This absorbs some of the excess supply of dollars so that reserves do not fall by the same amount. Thus, ordinary least squares estimates of the coefficients will be biased. See Magee (1976). In particular, the coefficient for $[D/(R+D)].g_D$ will be biased away from unity.

c. *Simultaneity*: The small country, long-run, full-employment assumptions allow monetarists to assume that income, Y, prices, P, and interest rates, i, are exogenous and unaffected by the supply of money. But if they are not, ordinary least squares estimates of the reserve flow equation can lead to simultaneous equation bias. Consider causation the other way. In a typical Keynesian model, an autonomous increase in exports increases reserves, the money supply, real income, and possibly prices. Without proper specification and estimation, we do not know whether the coefficients in the reserve flow equation reflect just the interaction between the demand for and supply of money, or the influence of money on income and prices. See Magee (1976).

It is appropriate at this point to consider sterilization further. Consider the case in the previous paragraph. After the autonomous increase in exports

and the consequent increase in reserves (R), the money supply, real income, and money demand, assuming no sterilization, the coefficient for the domestic credit variable (D) in the reserve flow equation will be zero, since the increase in reserves (R) is absorbed by the demand for money while there is no change in domestic credit. However, if sterilization is complete, the coefficient will be -1. We should note that under the monetarist assumption of no sterilization, a non-monetarist result of zero coefficient for domestic assets, D, is obtained while under the non-monetarist assumption of complete sterilization, a monetarist result of a -1 coefficient for domestic asset, D, is obtained. These cases show that estimates of -1 for domestic assets, D, have little discriminatory power unless there is independent evidence about the degree of sterilization.

Due to these effects, ordinary least squares estimates of the coefficients of the reserve flow equation do not constitute a reliable empirical test of the monetary approach to the balance of payments. The following section discusses some of the ways that these problems have been dealt with in the literature.

Suggested Ways to Reduce the Problems

a. *Sterilization*: To account for sterilization by central banks, one can specify a central bank reaction function and estimate it simultaneously with the reserve flow equation. Genberg (1976), in his study of Sweden's balance of payments, considers the following central bank reaction function, together with a reserve flow equation:

$$[D/(R+D)].g_D(t) = b_0 + b_1.[R/(R+D)].g_R(t) + b_2.GT(t) + u_1(t)$$

$$[R/(R+D)].g_R(t) = a_0 + a_1.[D/(R+D)].g_D(t) + a_2.g_m(t) + a_3.[LOG\ P(t) - a.LOG\ P(t-1)] + a_4.[LOG\ Y(t) - a.LOG\ Y(t-1)] + a_5.[LOG_{\ i}(t) - a.LOG_{\ i}(t-1)] + a_6.LOG\ M(t-1) + u_2(t)$$

where GT is the government debt outstanding. The central bank reaction function assumes that open market operations are dictated by the change in

international reserves (the sterilization hypothesis) and the change in outstanding governmental debt (on the hypothesis that the central bank is a large source of finance for the government). For a comprehensive list of references in the context of the "reserve flow equation" and "exchange market pressure equation" of the monetary approach to balance of payments which discuss sterilization see appendix 8. For a comprehensive list of references in the context of the "capital flow equation" of the monetary approach to balance of payments which discuss sterilization see appendix 9. For a comprehensive list of references in the context of the "reserve flow equation" and "exchange market pressure equation" of the monetary approach to balance of payments which discuss the central bank reaction function see appendix 10. For a comprehensive list of references in the context of the "capital flow equation" of the monetary approach to balance of payments which discuss the central bank reaction function see appendix 11. For a comprehensive list of references in the context of the "reserve flow equation" of the monetary approach to balance of payments which discuss the causality tests of the type Granger (1969), Geweke (1978), Haugh (1976), Hausman (1978), or Sims (1972) see appendix 12.

The results of two stage least squares estimates of the parameters, using quarterly data for the period 1950-II to 1968-IV, are reported in Table 4. The results indicate that the specification of the central bank reaction function is inadequate, in that the government financing fails to be significant. This is likely to be the result of short-run instability of the central bank's policy response due to the existence of many alternative targets. Experiments with yearly data did produce a significantly positive b_2 which was consistent with the long-run need for deficit financing through the central bank.

Table 4: Genberg's Model: Two-Stage Least Squares Estimates of the Parameters

Money*	a_0	a_1	a_2	a_3	a_4 (P)	a_4 (T)	a_4 (C)	a_5	a_6	b_0	b_1	b_2
M1	0.43	-1.31	-0.27	1.12	-0.14	0.20		0.01	-0.04	0.012	-0.57	0.02
	(0.26)	(1.03)	(0.49)	(0.74)	(0.37)	(0.48)		(0.03)	(0.02)	(0.004)	(0.25)	(0.06)
M1	0.39	-1.23	-0.23	1.06			-0.04	0.01	-0.04	0.011	-0.53	0.02
	(0.17)	(0.63)	(0.30)	(0.45)			(0.25)	(0.03)	(0.02)	(0.004)	(0.27)	(0.06)
M2	-0.01	1.39	-0.87	0.90	-0.58	0.24		0.00	0.01	0.016	0.94	0.03
	(0.10)	(0.28)	(0.66)	(0.33)	(0.41)	(0.47)		(0.02)	(0.02)	(0.003)	(0.21)	(0.05)
M2	0.03	-1.11	-0.53	0.81			-0.02	0.00	0.00	0.015	-0.88	-0.02
	(0.05)	(0.37)	(0.31)	(0.21)			(0.23)	(0.02)	(0.01)	(0.003)	(0.21)	(0.05)

* "Money" refers to the definition of money used in the regression.

P = Permanent income T = Transitory income C = Current income

The numbers in parenthesis indicate standard errors.

As far as the reserve flow equation is concerned, the estimates of the coefficients of g_D, g_m, and g_P are not significantly different from their expected values of -1 (for the first two) and +1. The income and interest rate coefficients are not significant at 95 percent confidence level. Genberg (1976) concludes that it does not appear that the sterilization hypothesis offers a very plausible alternative to the explanation of reserve flows.

In general, a considerable literature has arisen from empirical investigations of sterilization. While these studies indicate that at least some degree of sterilization has been or could be undertaken in the short run by the countries surveyed, they also suggest a wide range of experience, even among industrialized nations. Besides indicating wide variations in experience among countries, all studies conducted so far have been subject to serious problems of simultaneity, revealing the need for much more work to develop better empirical tests of the general applicability of the monetary approach and its policy implications. See Whitman (1975).

b. *Exchange Rate*: To account for the excluded variable of foreign exchange rates, one can use the "exchange market pressure" formulation of

the monetary approach developed by Lance Girton and Don Roper (1977). In their formulation of the monetary approach the dependent variable is the sum of: (i) the change in reserves as a percentage of the base, and, (ii) the percentage rate of appreciation of the domestic currency. This allows disequilibrium among national money markets to be resolved by reserve flows, changes in the exchange rate, or some combination of the two. For a comprehensive list of references which have followed this approach see appendix 13.

In a two-country model, where one of them is the reserve currency country, the authors derive the following equation for the non-reserve currency country:

$$[(DR/H) + D(1/r)/(1/r)] = a.(DD/H) + b.[DH(v)/H(v)] + c.(DY/Y) + d.[DY(v)/Y(v)]$$

where r is the foreign exchange rate, H is the monetary base, and variables preceding (v) pertain to the reserve currency country. As shown in Table 5, for the composite dependent variable over the 1952-74 period annual estimates for Canada vis-à-vis the United States yield good fits. The United Sates is considered the reserve currency country.

Table 5: Girton-Roper Model

Money*	Constant	a	b	c	d	R-squared	D-W
M2	-0.04	-0.96	1.14	2.80	-2.84	0.92	1.80
	(1.08)	(12.74)	(4.86)	(3.01)	(3.59)		
M1	-0.03	-0.96	1.74	2.54	-2.51	0.95	2.11
	(1.38)	(16.03)	(8.37)	(3.97)	(4.83)		
H	-0.03	-0.97	1.61	2.63	-2.62	0.96	2.29
	(1.43)	(18.53)	9.09	4.46	5.35		

* "Money" refers to the definition of money used in the regression.

The numbers in parethesis are t-statistics.

In this section, typical empirical work on the monetary approach to the balance of payments based on long-run analysis were reviewed and some problems involved with ways to reduce them were discussed. In the next section, the same methodology will be followed for existing empirical work on the monetary approach to the balance of payments based on a short-run approach.

CONCLUSION

This paper provided a review of the seminal long-run empirical research on the monetary approach to the balance of payments with a comprehensive reference guide to the literature. The paper reviewed the three major alternative theories of balance of payments adjustments. These theories were the elasticities and absorption approaches (associated with Keynesian theory), and the monetary approach. In the elasticities and absorption approaches the focus of attention was on the trade balance with unemployed resources. The elasticities approach emphasized the role of the relative prices (or exchange rate) in balance of payments adjustments by considering imports and exports as being dependent on relative prices (through the exchange rate). The absorption approach emphasized the role of income (or expenditure) in balance of payments adjustments by considering the change in expenditure relative to income resulting from a change in exports and/or imports. In the monetary approach, on the other hand, the focus of attention was on the balance of payments (or the money account) with full employment. The monetary approach emphasized the role of the demand for and supply of money in the economy. The paper focused on the monetary approach to balance of payments and reviewed the seminal long-run empirical work on the monetary approach to balance of payments. Throughout, the paper provided a comprehensive set of references corresponding to each point discussed. Together, these references would exhaust the existing long-run research on the monetary approach to balance of payments.

APPENDIX 1

This is a comprehensive list of references which have estimated or discussed either the "reserve flow equation" or the "exchange market pressure equation."

Aghevli and Khan (1977), Akhtar (1986), Akhtar, Putnam, and Wilford (1979), Arize, Grivoyannis, Kallianiotis, and Melindretos (2000), Asheghian (1985), Bean (1976), Beladi, Biswas, and Tribedy (1986), Bhatia (1982), Bilquees (1989), Blejer (1979), Bourne (1989), Boyer (1979), Brissimis and Leventakis (1984), Burdekin and Burkett (1990), Burkett, Ramirez, and Wohar (1987), Burkett and Richards (1993), Civcir and Parikh (1992), Cobham (1983), Connolly (1985), Connolly and Da Silveira (1979), Connolly and Taylor (1976, 1979), Coppin (1994), Costa Fernandes (1990), Courchene and Singh (1976), Cox (1978), Cox and Wilford (1976), Farhadian and Dunn, Jr. (1986), Feige and Johannes (1981), Fontana (1998), Frenkel, Gylfason, and Helliwell (1980), Genberg (1976), Girton and Roper (1977), Grubel and Ryan (1979), Guitian (1976), Gupta (1984), Hacche and Townend (1981), Hodgson and Schneck (1981), Ibrahim and Williams (1978), Jager (1978), Jayaraman (1993), Jimoh (1990), Johannes (1981), Joyce and Kamas (1985), Kamas (1986), Kemp and Wilford (1979), Kenneally and Finn (1985), Kenneally and Nhan (1986), Khan (1973, 1990), Killick and Mwega (1993), Kim (1985), Laney (1979), Lee and Wohar (1991), Leiderman (1980), Leon (1988), Looney (1991), Luan and Miller (1979), Mah (1991), Martinez (1999), McCloskey and Zecher (1976), McNown and Wallace (1977), Miller (1978), Modeste (1981), Pentecost, Van Mooydonk, and Van Poeck (2001), Phaup and Kusinitz (1977), Putnam and Wilford (1986), Rasulo and Wilford (1980), Roper and Turnovsky (1980), Sargen (1975, 1977), Sheehey (1980), Sohrab-Uddin (1985), Sommariva and Tullio (1988), Spanos and Taylor (1984), Taylor, M.P. (1987a, 1987b), Thornton (1995), Tullio (1979, 1981), Watson (1988, 1990), Weymark (1995), Wilford (1977), Wilford and Wilford (1977, 1978), Wilford and Zecher (1979), Wohar and Burkett (1989), Wohar and Lee (1992), and Zecher (1974).

APPENDIX 2

This is a comprehensive list of references which have estimated the "capital flow equation."

Argy and Kouri (1974), Artus (1976), Brunner (1973), Darby (1980), De Grauwe (1975), Fratiani (1976), Herring and Marston (1977), Hodjera (1976), Kouri (1975), Kouri and Porter (1972, 1974), Kulkarni (1985), Laskar (1981, 1982), Luan and Miller (1979), Martinez (1999), Murray (1978), Neuman (1978), Obstfeld (1980, 1982), Porter (1972, 1974), and Stockman (1979).

APPENDIX 3

This is a comprehensive list of references which have either estimated the "reserve flow equation" or estimated the demand for money and substituted it in the "reserve flow equation."

Aghevli and Khan (1977), Akhtar (1986), Akhtar, Putnam, and Wilford (1979), Arize, Grivoyannis, Kallianiotis, and Melindretos (2000), Asheghian (1985), Bean (1976), Beladi, Biswas, and Tribedy (1986), Bhatia (1982), Bilquees (1989), Blejer (1979), Boyer (1979), Civcir and Parikh (1992), Cobham (1983), Connolly and Taylor (1976, 1979), Coppin (1994), Courchene and Singh (1976), Cox (1978), Cox and Wilford (1976), Fontana (1998), Frenkel, Gylfason, and Helliwell (1980), Genberg (1976), Grubel and Ryan (1979), Guitian (1976), Gupta (1984), Ibrahim and Williams (1978), Jager (1978), Jayaraman (1993), Jimoh (1990), Johannes (1981), Joyce and Kamas (1985), Kamas (1986), Kemp and Wilford (1979), Kenneally and Finn (1985), Khan (1973, 1990), Killick and Mwega (1993), Leiderman (1980), Leon (1988), Looney (1991), Luan and Miller (1979), McCloskey and Zecher (1976), McNown and Wallace (1977), Miller (1978), Phaup and Kusinitz (1977), Putnam and Wilford (1986), Rasulo and Wilford (1980), Roper and Turnovsky (1980), Sheehey (1980), Sohrab-Uddin (1985), Sommariva and Tullio (1988), Spanos and Taylor (1984), Taylor, M.P. (1987a, 1987b), Tullio (1979, 1981), Watson (1988, 1990), Wilford (1977), Wilford and Wilford (1977, 1978), Wilford and Zecher (1979), Wohar and Burkett (1989), and Zecher (1974).

APPENDIX 4

This is a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation" and/or theoretically have discussed signs and values of the coefficients in the context of the monetary approach to balance of payments.

Aghevli and Khan (1977), Akhtar, Putnam, and Wilford (1979), Arize, Grivoyannis, Kallianiotis, and Melindretos (2000), Bean (1976), Beladi, Biswas, and Tribedy (1986), Bhatia (1982), Connolly and Taylor (1976, 1979), Dornbusch (1971), Fontana (1998), Frenkel, Gylfason, and Helliwell (1980), Genberg (1976), Hacche and Townend (1981), Jager (1978), Kamas (1986), Kemp and Wilford (1979), Kenneally and Finn (1985), Komiya (1969), Lee and Wohar (1991), Leon (1988), Looney (1991), McNown and Wallace (1977), Miller (1978), Modeste (1981), Purviz (1972), Putnam and Wilford (1986), Reid (1973), Spanos and Taylor (1984), Taylor, M.P. (1987b), Tullio (1979, 1981), Wein (1974), Wilford (1977), Wilford and Wilford (1977, 1978), Wilford and Zecher (1979), Wohar and Lee (1992), and Zecher (1974).

APPENDIX 5

This is a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation" and have not only discussed signs and values of the coefficients in the context of the monetary approach to balance of payments but also contrasted them with those as expected by the Keynesian approach.

Aghevli and Khan (1977), Akhtar, Putnam, and Wilford (1979), Bean (1976), Beladi, Biswas, and Tribedy (1986), Bhatia (1982), Dornbusch (1971), Frenkel, Gylfason, and Helliwell (1980), Kamas (1986), Kenneally and Finn (1985), Lee and Wohar (1991), Looney (1991), McNown and Wallace (1977), Miller (1978), Purviz (1972), Putnam and Wilford (1986), Reid (1973), Taylor, M.P. (1987b), Tullio (1979), Wein (1974), Wilford (1977), Wilford and Wilford (1977, 1978), Wilford and Zecher (1979), and Wohar and Lee (1992).

APPENDIX 6

This is a comprehensive list of references which have estimated either the "reserve flow equation" or the "exchange market pressure equation" and have not only discussed signs and values of the coefficients in the context of the monetary approach to balance of payments and contrasted them with those as expected by the Keynesian approach but also explicitly decided in favor of one theory or the other.

Kenneally and Finn (1985), Lee and Wohar (1991), Putnam and Wilford (1986), Taylor, M.P. (1987b), Tullio (1979), Wilford (1977), Wilford and Wilford (1977, 1978), Wilford and Zecher (1979), and Wohar and Lee (1992).

APPENDIX 7

This is a comprehensive list of references which have estimated the demand for money and substituted it in the "reserve flow equation."

Aghevli and Khan (1977), Genberg (1976), Jimoh (1990), Kenneally and Finn (1985), Khan (1990), McCloskey and Zecher (1976), and Watson (1988).

APPENDIX 8

This is a comprehensive list of references in the context of the "reserve flow equation" and "exchange market pressure equation" of the monetary approach to balance of payments which discuss sterilization.

Akhtar (1986), Arize, Grivoyannis, Kallianiotis, and Melindretos (2000), Bean (1976), Blejer (1979), Boyer (1979), Burkett and Richards (1993), Cobham (1983), Connolly and Taylor (1979), Feige and Johannes (1981), Fontana (1998), Genberg (1976), Gupta (1984), Hacche and Townend (1981), Jager (1978), Johannes (1981), Joyce and Kamas (1985), Kamas (1986), Kenneally and Finn (1985), Killick and Mwega (1993), Kim (1985), Laney (1979), Lee and Wohar (1991), Leiderman (1980), Leon (1988), Luan and Miller (1979), Phaup and Kusinitz (1977), Shorab-Uddin (1985), Taylor, M.P. (1987a), Tullio (1979, 1981), Watson (1988, 1990), and Wohar and Burkett (1989).

APPENDIX 9

This is a comprehensive list of references in the context of the "capital flow equation" of the monetary approach to balance of payments which discuss sterilization.

Argy and Kouri (1974), Artus (1976), Darby (1980), Dombrecht (1978), Herring and Marston (1977), Hodjera (1976), Kouri (1975), Kouri and Porter (1974), Laskar (1981, 1982), Luan and Miller (1979), Martinez (1999), Murray (1978), Obstfeld (1982), Porter (1972), and Stockman (1979).

APPENDIX 10

This is a comprehensive list of references in the context of the "reserve flow equation" and "exchange market pressure equation" of the monetary approach to balance of payments which discuss the central bank reaction function.

Cobham (1983), Connolly and Taylor (1979), Genberg (1976), Jager (1978), Kamas (1986), Kenneally and Finn (1985), Laney (1979), Lee and Wohar (1991), Leon (1988), Luan and Miller (1979), Shorab-Uddin (1985), Tullio (1981), and Watson (1988).

APPENDIX 11

This is a comprehensive list of references in the context of the "capital flow equation" of the monetary approach to balance of payments which discuss the central bank reaction function.

Argy and Kouri (1974), Artus (1976), Darby (1980), Herring and Marston (1977), Hodjera (1976), Laskar (1981, 1982), Martinez (1999), Murray (1978), and Stockman (1979).

APPENDIX 12

This is a comprehensive list of references in the context of the "reserve flow equation" of the monetary approach to balance of payments which discuss the causality tests of the type Granger (1969), Geweke (1978), Haugh (1976), Hausman (1978), or Sims (1972).

Blejer (1979), Burkett and Richards (1993), Feige and Johannes (1981), Fontana (1998), Gupta (1984), Johannes (1981), Joyce and Kamas (1985), Kamas (1986), Killick and Mwega (1993), Lee and Wohar (1991), Leiderman (1980), Martinez (1999), Phaup and Kusinitz (1977), Taylor, M.P. (1987a, 1987b), Wohar and Burkett (1989), and Wohar and Lee (1992).

APPENDIX 13

This is a comprehensive list of references which have estimated the "exchange market pressure equation."

Bourne (1989), Brissimis and Leventakis (1984), Burdekin and Burkett (1990), Burkett, Ramirez, and Wohar (1987), Burkett and Richards (1993), Connolly (1985), Connolly and Da Silveira (1979), Costa Fernandes (1990), Farhadian and Dunn, Jr. (1986), Feige and Johannes (1981), Girton and Roper (1977), Hacche and Townend (1981), Hodgson and Schneck (1981), Jimoh (1990), Kenneally and Finn (1985), Kenneally and Nhan (1986), Kim (1985), Laney (1979), Lee and Wohar (1991), Mah (1991), Martinez (1999), Modeste (1981), Pentecost, Van Mooydonk, and Van Poeck (2001), Sargen (1975, 1977), Thornton (1995), Weymark (1995), and Wohar and Lee (1992).

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THE IMPACT OF DOMINANT RELIGION ON INTERNATIONAL TRADE

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ABSTRACT

The destruction of New York's World Trade Center by religious fanatics on September 11, 2001 led many commentators to question whether religion and globalization are compatible. The relationship is complicated by its theoretical ambiguity: religion can both enhance and suppress economic activity in general, and its potential network effect can both create and divert trade. There have been few empirical studies to shed light on the matter, however. This paper fills this void by examining the empirical relationship between religion and international trade.

AN INTRODUCTION TO THE AMBIGUOUS ECONOMIC EFFECTS OF RELIGION

Religion is an institution that guides general economic behavior, and it therefore also affects the important economic activity of international trade. Religions often promote "economically-friendly" behavior, such as honesty, diligence, and the provision of public goods. But, because religions focus on spiritual issues rather than the "pursuit of happiness," they may also suppress people's motivation to engage in welfare-enhancing economic transactions. Religion's overall influence on trade-enhancing institutions is, therefore, ambiguous. (Iannaconne, 1998) observes in his survey of the literature on religion and economic activity that "religion seems to matter, but its impact is far from uniform." Iannaccone's survey also reveals how sparse the research on this issue is. How religion influences the institutions that directly affect international trade has not been systematically examined by economists.

Religion may also have a network effect that facilitates complex economic transactions among people in different countries. Religion's role in creating international trade networks has been investigated by (Greif, 1989; Grief, 1994; Rauch, 1999; Rauch, 2001; Rauch & Trindade, 1999). The sharing of religious beliefs can mitigate problems such as adverse selection, moral hazard, and default. Therefore, religion can facilitate complex economic transactions among people in different countries. These network effects of religion are not necessarily favorable to increased international trade, however. Networks can divert trade as well as create trade. Furthermore, networks may hinder the long-run growth of trade by limiting the entry of new participants and the inclusion of new products. Recent works by (Mokyr, 1990; Holmes & Schmitz, 1995; Parente & Prescott, 2000) showed that vested interests often obstruct competition and economic change, suggesting that networks may serve to protect certain participants from competition from those outside their network.

TESTING THE RELATIONSHIP BETWEEN RELIGION AND TRADE USING THE GRAVITY MODEL

These ambiguous theoretical results signal the need for an empirical study of religion's effects on international trade. In order to test the institutional and network effects of religion on trade, an augmented gravity model is applied. The gravity model normally explains 70 percent or more of the cross section variation in world trade volumes, and it has proven useful for examining the importance of potential influences on trade. The model is theoretically attractive because it can be derived from a number of traditional trade models; see (Linnemann, 1966; Leamer & Stern, 1970; Anderson, 1979; Deardorff, 1998).

The standard gravity equation specifies trade between a pair of countries to be a negative function of the distance between the countries and a positive function of their combined national products. This equation is usually augmented to account for geographic, ethno-linguistic, and economic conditions. A common form of the gravity model is

$$(1) \qquad tot_{ij} = a_0 + a_1(gdp_i gdp_j) + a_2(pop_i\ pop_j) + a_3 dist_{ij} + a_4 CONT_{ij} + a_5 LANG_{ij} + a_6 FTA_{ij} + u_{ij},$$

in which tot_{ij} is the log of bilateral trade between countries i and j, $gdp_i gdp_j$ is the log of GDP for i and j, $dist_{ij}$ is the log of geographic distance between i and j, $pop_i\ pop_j$ is the log of the product of the populations in country i and j, and CONT, LANG, and FTA are dummy variables for pairs of countries that have a contiguous border, a common language, and are members of the same active free trade area, respectively. For recent gravity studies see, for example, (Frankel, Stein & Wei, 1995; McCallum, 1995; Eichengreen & Irwin, 1996; Deardorff, 1998; Frankel & Romer, 1999; Freund, 2000; Freund & Weinhold, 2000; Frankel & Rose, 2002).

ADDING RELIGION VARIABLES TO THE GRAVITY EQUATION

For religion to substantially influence a country's institutions, it must be a dominant religion. Minor religions adhered to by a few people are unlikely to have much effect on a country's overall economic institutions and, hence, its aggregate level of international trade. A dominant religion can be defined as one that is followed by at least 75 percent of the country's population. Religion's network effect depends on whether people in different countries share the same religion. Therefore, to distinguish between religion's influence on trade through the institutional channel and the network channel, three dummy variables are introduced into the augmented gravity equation: DOM for each pair of countries in which one trade partner has a dominant religion, DIFDOM when trade partners both have dominant, but different, religions, and SAMEDOM for country pairs in which both countries have the same dominant religion. If a dominant religion's influence on a country's institutions has a general effect on its ability to engage in international trade, then the DOM and DIFDOM dummies should be significantly positive, with the latter being greater in magnitude than DOM. If the sharing of the same dominant religion has a positive network effect, then SAMEDOM dummy should be significantly positive.

In recognition of potential omitted variable bias, several institutional and network variables are added to equation (1): a dummy (LAW_{ij}) to capture the network effect of having a common legal structure using data from (Djankov, La Porta, Lopez-de-Silane & Shleifer, 2002), the bi-lateral average of (Kaufmann, Kraay & Zoido Lobaton's, 1999) government regulation variable ($burden_{ij}$) to capture other institutional effects, and two communications channels, $cyber_i cyber_j$ and $phone_i phone_j$, the log of the bilateral product of top domain web hosts and telephones per thousand in countries i and j, respectively [See data sources in the Appendix]. This leaves the extended gravity model:

$$
\begin{aligned}
(2) \qquad tot_{ij} = {} & a_0 + a_1(gdp_i gdp_j) + a_2(pop_i\, pop_j) + a_3 dist_{ij} + a_4 CONT_{ij} \\
& + a_5 LANG_{ij} + a_6 FTA_{ij} + a_7 DOM_{ij} + a_8 DIFDOM_{ij} \\
& + a_9 SAMEDOM_{ij} + a_{10} LAW_{ij} + a_{11}(burden_{ij}) \\
& + a_{12}(cyber_i cyber_j) + a_{13}(phone_i phone_j) + u_{ij}.
\end{aligned}
$$

REGRESSION RESULTS

Most studies estimate the gravity equation (2) in double logarithmic form so that the estimated coefficients can be interpreted as elasticities. This technique omits country pairs whose bilateral trade is zero, or about twenty percent of the observations in this study. Omitting these observations biases the results. Therefore, the scaled OLS (SOLS) technique first used by (Eichengreen & Irwin, 1995), in which the dependent variable is expressed as $\log(1 + TRADE_{ij})$. (Greene, 2003) shows that the transformed variable approximates a "semi-log Tobit relationship;" for small values of $TRADE_{ij}$ the logarithm is close to zero, and for large values of $TRADE_{ij}$ the logarithm of the transformed variable is close to the logarithm of $TRADE_{ij}$. This approach yields results that are similar to those for a Tobit regression, and the double log form is maintained.

To check for estimation robustness, equation (2) is also estimated using nonlinear least squares technique similar to that applied by (Coe & Hoffmaister, 1999; Coe, Subramanian & Tamarisa, 2002). This method essentially changes the equation into an exponential form, and by not actually

putting the data in logarithmic form we can include the observations for which trade is zero.

Column 2 in Table 1 presents the SOLS results for the baseline gravity model using data on the bilateral trade volumes between 84 countries during the year 1998. As is common for gravity models, nearly 80 percent of the variation in bilateral trade is explained. All signs are as expected and significant at the 95 percent level. Nonlinear estimates converted to be compatible with the logarithmic results of the SOLS regressions are given in Column 5; the similarity between columns 2 and 5 adds robustness to the results.

Table 1: The Gravity Model and Dominant Religions

	Equation (1) SOLS	Equation (2) SOLS	Equation (3) SOLS	Equation (1) Nonlinear	Equation (2) Nonlinear	Equation (3) Nonlinear
Constant	-6.695 (-24.62)**	-4.883 (-14.99)**	-4.714 (-14.10)**	-7.674 (-18.17)**	-6.777 (-10.39)**	-6.703 (-10.56)**
$gdp_i gdp_j$	0.687 (75.78)**	0.666 (30.87)**	0.668 (29.34)**	0.851 (43.09)**	0.861 (13.19)**	0.895 (11.94)**
$pop_i\ pop_j$	-0.072 (-5.81)**	-0.101 (-4.09)**	-0.111 (-4.26)**	-0.061 (-1.43)	-0.137 (-1.49)	-0.178 (-1.82)*
$dist_{ij}$	-0.594 (-24.61)**	-0.689 (-28.02)**	-0.696 (-27.73)**	-0.526 (-21.06)**	-0.596 (-19.79)**	-0.501 (-13.76)**
$CONT_{ij}$	0.759 (6.83)**	0.590 (5.49)**	0.575 (5.32)**	1.207 (6.69)**	1.042 (5.46)**	1.069 (5.48)**
$LANG_{ij}$	0.521 (7.72)**	0.243 (3.24)**	0.305 (4.02)**	0.457 (3.92)**	0.348 (2.50)**	0.420 (2.83)**
FTA_{ij}	0.475 (8.47)**	0.293 (5.29)**	0.282 (5.03)**	0.473 (4.17)**	0.362 (3.17)**	0.344 (2.48)**
DOM_{ij}		0.049 (1.02)			-0.140 (-1.08)	
SAME DOM_{ij}		-0.372 (-5.26)**			-0.126 (-2.75)**	
$DIFDOM_{ij}$		-0.314 (-5.78)**			-0.043 (-0.22)	

Table 1: The Gravity Model and Dominant Religions						
	Equation (1) SOLS	Equation (2) SOLS	Equation (3) SOLS	Equation (1) Nonlinear	Equation (2) Nonlinear	Equation (3) Nonlinear
LAW_{ij}		0.365 (7.96)**	0.354 (7.61)**		0.467 (6.13)**	0.451 (5.08)**
$burden_{ij}$		0.282 (4.34)**	0.366 (5.54)**		0.347 (1.32)	0.592 (2.11)**
cyber- $_i cyber_j$		0.081 (8.28)**	0.087 (8.23)**		0.105 (3.14)**	0.107 (2.28)**
$phone_i$ $phone_j$		-0.188 (-7.59)**	-0.215 (-8.23)**		-0.259 (-3.55)**	-0.328 (-2.95)**
DOM Buddhist			0.356 (3.47)**			0.421 (2.39)**
DOM Catholic			-0.157 (-3.04)**			-0.327 (-2.57)**
DOM Hindu			-0.386 (-3.17)**			-0.476 (-2.56)**
DOM Judaism			-0.331 (-1.86)*			-0.294 (-0.58)
DOM Muslim			-0.119 (-1.72)*			-0.174 (-0.94)
DOM Orthodox			0.024 (0.26)			0.155 (0.61)
DOM Protestant			-0.019 (-2.56)**			-0.310 (-2.14)**
SAME Buddhist			0.660 (2.11)**			0.625 (0.62)
SAME Catholic			-0.265 (-3.33)**			-0.101 (-0.37)
SAME Hindu			0.802 (0.78)			0.825 (1.44)
SAME Muslim			-0.042 (-0.21)			-0.039 (-0.07)
SAME Orthodox			0.878 (2.62)**			1.111 (2.34)**

Table 1: The Gravity Model and Dominant Religions

	Equation (1) SOLS	Equation (2) SOLS	Equation (3) SOLS	Equation (1) Nonlinear	Equation (2) Nonlinear	Equation (3) Nonlinear
SAME Protestant			0.005 (0.02)			0.280 (0.52)
R^2	0.783	0.800	0.800	0.816	0.823	0.834

Notes: Figures in parentheses are heteroskedasticity-consistent t-statistics. ** indicates significant at the 95% level, and * at the 90% level. With 84 countries, there are 3486 data points (=84*(83/2)). Dominant Buddist countries are Japan and Thailand, dominant Catholic countries are Argentina, Austria, Belgium, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, France, Guatemala, Honduras, Ireland, Italy, Mexico, Nicaragua, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Spain, and Venezuela, dominant Hindu countries are India and Nepal, the dominant Judaic country is Israel, dominant Muslim countries are Algeria, Bangladesh, Indonesia, Iran, Mauritania, Saudi Arabia, Tunisia, and Turkey, dominant Orthodox countries are Belarus, Georgia, Greece, Moldova, and Ukraine, dominant Protestant countries are Denmark, Estonia, Finland, Norway, Sweden, and the United Kingdom..

Columns 3 and 6 in Table 1 present the results for regression equation (2). All coefficients except DOM are significant and compatible with the baseline gravity model regression. The coefficient for DOM is positive but small and not statistically significant; the coefficient for DIFDOM is significant using SOLS and equal to !0.314, which implies that, all other things equal, two countries with different dominant religions trade 31 percent less. Finally, the SAMEDOM coefficient tells us that when two countries share the same dominant religion, then all other things equal they trade 38 percent less. These results suggest that the presence of a dominant religion has no institutional effect, or possibly a negative institutional effect, on trade. The negative SAMEDOM coefficient suggests that the network effects related to countries' sharing of religious institutions cause more trade diversion than trade creation.

THE TRADE IMPACT OF SPECIFIC RELIGIONS

The gravity model can be extended further to distinguish the impact of specific dominant religions on trade flows. By adding dummies for

specific dominant religions (DOM) and shared dominant religions (SAME), the regression model becomes:

$$
\begin{aligned}
(3) \qquad tot_{ij} = {} & a_0 + a_1(gdp_i gdp_j) + a_2(pop_i\, pop_j) + a_3 dist_{ij} \\
& + a_4 CONT_{ij} + a_5 LANG_{ij} + a_6 FTA_{ij} \\
& + a_7 LAW_{ij} + a_8(burden_{ij}) + a_9(cyber_i cyber_j) \\
& + a_{10}(phone_i phone_j) + a_{11}(DOMBuddhist) \\
& + a_{12}(DOMCatholic) + a_{13}(DOMHindu) \\
& + a_{14}(DOMJudaism) + a_{15}(DOMMuslim) \\
& + a_{16}(DOMProtestant) + a_{17}(SAMEBuddhist) \\
& + a_{18}(SAMECatholic) + a_{19}(SAMEHindu) \\
& + a_{20}(SAMEMuslim) + a_{21}(SAMEOrthodox) \\
& + a_{22}(SAMEProtestant) + u_{ij}.
\end{aligned}
$$

Estimation results for equation (3) are found in columns 4 and 7 in Table 1. The results indicate that when Catholic, Hindu, Judaism, Muslim, or Protestant religions are dominant, trade is reduced. The dominance of the Orthodox religion has an insignificantly positive institutional effect, and only Buddhism has a significantly positive institutional effect on trade. The network effects of individual religions are mostly insignificant. However, when countries share the Orthodox and Buddhist religions, trade is enhanced. Catholicism has a negative network effect.

CONCLUSIONS

Is religion compatible with globalization? The evidence from the regressions relating dominant religions and international trade suggests that dominant religion seems to have negative effect on trade. Focusing on individual religions reveals that most religions discourage trade. An exception is Buddhism, whose institutional and network effects both seem to encourage trade.

DATA APPENDIX

Bilateral trade data are from the International Monetary Fund's *Direction of Trade Statistics Yearbook*, 2000 (IMF, Washington, D.C.). Gross Domestic Product in millions of U.S. dollars, population, telephone lines per 1,000 people, free trade areas, and number of top domain internet hosts per 1,000 people are from the World Bank's 2001 *World Development Indicators* (World Bank, Washington D.C.). Distance (kilometers between capital cities) is from the *U.S. Geological Survey* (ftp://kai.er.usgs.gov/pub/). Common borders, common languages, and fraction of population claiming adherence to religions are from the *CIA World Factbook* 2000, (http://www.cia.gov/cia/publications/factbook/).

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THE POTENTIAL OF BIOTECHNOLOGY: PROMISES, PERILS, PERPLEXITIES - A SURVEY OF IMPACTS ON RELEVANT ECONOMIC SECTORS

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ABSTRACT

Biotechnology is the latest scientific innovation that shows great economic promise but also raises many immediate as well as long term societal concerns. In the current state of the art, biotechnology has four broad areas of economic application: improving properties of plants (ag-biotech) and food (food-biotech), making industrial intermediates (industry-biotech), producing diagnostic materials and drugs from organisms (biopharmaceuticals), and mitigating pollution (environmental-biotech).

The scientific developments in biotechnology are exciting in the likely economic value to society. The deliverables today are only a miniscule proportion of the potential that has been mapped out. There are also environmental benefits in terms of avoided mitigation costs and intergenerational resource savings.

Despite the obvious glitter and prosperity associated with biotechnology, the public and some industrial communities have been slow on the uptake. There are also pertinent concerns regarding safety, containment and segregation of transgenic produce.

Increasing the level of public awareness has to be a central objective for successful adoption of this technology, and this is a task that needs to be addressed by businesses, industry groups, professionals and regulators alike.

The technology itself is powerful and transcends the bounds of the handful of industries that have currently adopted or experimented with biotechnology.

INTRODUCTION

In the broadest sense of the term, biotechnology implies anthropocentric interventions in the natural gene pool. This could take the simple form of favoring certain species over others, for example, by selecting the best seeds for replanting, or retaining the highest yielding animals for breeding, while slaughtering the rest. Hence, the advent of biotechnology can be traced to prehistoric times, with the first attempts to nurture only desirable plants and animals for consumption by human societies.

While early biotechnology involved creating product improvements by selection, cross-breeding and using whole organisms, the modern day version is based on the use of sub-cellular material. Recent advances in molecular biology has made it possible to transfer DNA from practically any source to create genetically modified organisms (GMOs) that display the desired functional traits (Nap et al., 2003). Thus, the process and ability to genetically transform organisms through recombinant DNA (rDNA) technology - thereby creating transgenics, or GMOs - is the theme of modern biotechnology.

Although there is amazing diversity in creation - ranging from a simple bacteria to the most complex human being - the cells of all organisms are composed of the same fundamental building material and speak the same genetic language. The astonishing ability of biotechnology to transfer genes across organisms is based on this universality of all organisms.

Table 1 provides a brief glimpse of the development of biotechnology as viewed through important milestones. It is apparent that the developments vindicate the Tofflerian theory of the increasing rate of change in scientific discoveries (see, e.g., Toffler, 1971).

The use of biotechnology can be broadly classified into 4 functional areas:	
1.	Agricultural, food and forestry products
2.	Environmental uses
3.	Industrial biotech
4.	Biopharmaceuticals

The first relates to improving agronomic and environmental attributes of plants, such as yield, stress management skills, pest and disease resistance. This promises to generate huge benefits in terms of better harvests, lower production costs and less environmental damage from agrochemicals. In the food sector, the objective is to develop product attributes that have greater consumer appeal, and add nutritional value to food. The latter application somewhat overlaps those health supplements (also called nutriceuticals) that are derived or extracted from plants, since transgenic produce can be tailor made to supply many nutritional elements. This has given rise to the saying that there will soon be a fuzzy line between the pantry and the medicine cabinet (PEW, 2002).

The direct environmental application of biotechnology has been in developing GMOs that can mitigate pollution - transgenic bacteria that can assimilate oil spills, for instance. There are also indirect environmental benefits from most other functional uses of biotechnology: lower pesticide use through ag-biotech, faster growing trees that can sequester carbon, biopolymers, industrial bio-enzymes, are some examples.

Industrial biotech refers to using GMOs for producing industrial raw materials - for example, using transgenic bacteria to produce enzymes and acids.

Table 1. Important milestones in the evolution of biotechnology	
Dateline	Landmarks
8000 BC	Earliest record of human intervention in genetic selection - domestication of livestock and crops (potato).
4000 BC	First active use of organisms in production - cheese and wine (China, India), beer and bread (Egypt), selective pollination of dates (Babylon).
500 BC	First antibiotic - moldy tofu used to treat boils (China).
100s	First bio-pesticide - powdered chrysanthemum (China).
1300s	Arabs use artificial insemination for improving breed stocks of horses.
1700	Viral vaccination for smallpox (Jenner).
Early 1800s	Proteins discovered, first enzyme isolated.
Late 1800s	Darwin propounds his theory of evolution by natural selection. Mendel proposes the law of heredity - the science of genetics is launched.
Early 1900s	Bacteria used to treat sewage in Manchester, UK. The Human Growth Hormone (HGH) is discovered (Evans and Long). Penicillin is discovered as a life-saving antibiotic (Alexander Fleming). First commercial bio-pesticide (*Bt*) to control the corn-borer (France). Genetic material from different viruses shown to combine into a new virus.
1950s	Structure of DNA is published - start of modern genetics (Watson, Crick). First synthetic antibiotic is produced.
1960s	Messenger RNA (carrying developmental information in cells) is discovered. Green revolution starts with the creation of high-yielding foodgrain seeds. Genetic code is cracked (nucleotide bases determined).

Table 1. Important milestones in the evolution of biotechnology	
Dateline	Landmarks
1970s	First complete synthesis of a gene. Also HGH is synthesized. Recombinant DNA (rDNA) technology applied to human inherited disorder. First transgenic expressions - yeast gene in bacteria, human gene in bacteria.
1980s	Gene synthesizing machines developed. Recombinant life forms patented. Transgenics produced - mice (Ohio U.); cloned golden carp (China). DNA fingerprinting, genetic marker, recombinant vaccine, transgenic tobacco
1990s	*Bt*Corn (pest resistant), GM cow (human milk proteins), GM yeast, GM trout. Biotech foods - *FlavrSavr* tomato, bST beef. Industrial bio-enzymes. Biopharma - gene therapy, recombinant antibodies used for treating cancer. Biotech crops grown worldwide - *Bt*Corn / Cotton, Roundup Ready Soybean.
2000s	Plants as factories for therapeutic proteins (plant made pharmaceuticals). Complete map of the Human Genome published. Progress in explaining the differentiation of stem cells. High yield biotech crops in 150m acres. (Solve 3rd world nutrition problem?)
Source: BIO, 2003.	

Biopharmaceuticals is the fastest growing functional area since it can provide many diagnostic and therapeutic products that are beyond the scope of conventional treatment lines. A new branch of this functional area - known as plant-made-pharmaceuticals (PMPs) - appears to have great promise. Plants are extraordinary factories that have the ability to produce complex proteins, given the appropriate genetic signals. Growing therapeutic proteins in transgenic plants is the new technology for producing pharmaceuticals,

and provides a cleaner, cheaper and more stable alternative to cell culture and fermentation (for example, producing insulin in corn, as opposed to porcine, bovine or human tissue).

There is a rigorous system of multi-agency - USDA, EPA, FDA - checks and approvals of biotechnology products in the US. This process takes place over multiple-stages - with oversight continuing through the stages of discovery, development, testing, clinical/ consumer trials and marketing. The only current lacuna appears to be in post-market oversight - a critical area for measuring the long term impacts of GM products in enduse consumption, and use as productive factors, as well as in ensuring their safe handling and disposal (Taylor & Tick, 2003).

Despite the obvious glitter and prosperity associated with biotechnology, the public and some industrial communities have been slow on the uptake. Even after accounting for the usual rhetoric expected from activists, there are several pertinent concerns regarding the safety and containment aspects of transgenic produce. At this time, it is impossible to ascertain the complete package of impacts that an accidental leakage of GMOs can have on the ambient ecosystems. As well, it is difficult to predict the long term (unknown) health and environmental impacts of consuming GM products that are proven to be safe in the short term.

ECONOMIC IMPLICATIONS: AN EXAMPLE OF WELFARE GAINS FROM USING PLANT-BIOTECH TO COUNTER ENVIRONMENTAL STRESSES

Taking stock of the exciting scientific developments in biotechnology, the field seems to hold out tremendous economic value for society. Also, currently available applications are only a miniscule proportion of the possibilities. There are indirect benefits in terms of avoided environmental mitigation costs, as well as the intergenerational resource savings. Experts predict that biotechnology products and processes may extend average human lifespan by 10-15 years within the next 25 years. This not only adds the value of additional human productivity to society, but also the non-market value of human life.

Plants in all regions of the planet are subject to environmental stresses related to deviations from normal temperature, moisture and nutrient regimes. For the most part, these stresses are either benign or seasonal and are well tolerated. In fact, environmental stresses are sometimes beneficial, since they act as natural mechanisms for stimulating evolution. Stresses form an important part of the design toolbox of nature, forcing organisms to react and reorient, or be replaced.

Environmental stresses cause physiological and biochemical changes in plants. Just as the market price mechanism signals resource allocations in society, these changes cause resource reallocations in plants - for example, between the strategies of survival and propagation. Much of the distribution, domination and migration of plants depend on the stress management skills of individual species. The strategies of successful species are reflected in growth, reproduction, vegetative recovery and morphology, and vary from one plant species to another (Gehring & Whitham, 1995).

The most common universal stresses relate to temperature and moisture, while soil salinity is an important factor in some regions. A majority of plants can function within reasonable ranges of these factors, while some species develop great abilities to survive and reproduce under extreme weather and soil conditions. Given that natural changes to a landscape and climate is a slow process, the evolutionary mechanism in plants have historically been allowed adequate time and space for adaptation (Dunnett, Willis, Hunt & Grime, 1998). The process of evolutionary adaptation is slow - taking place over thousands of years. However, when the stress is beyond tolerance levels and the pace of change is rapid, then plants can either lose productive abilities or get replaced by migratory species. This not only has implications for the structure, biodiversity and functional stability of ecosystems, but can also impact supply side economics where commercial species are concerned.

Moreover, environmental stresses associated with anthropogenic modifications of the atmosphere can be of greater than normal magnitudes (by evolutionary standards) and can exceed plant tolerances.

When exposed to atmospheric and soil related stresses that are beyond their adaptive abilities, plants may react with slower vegetative growths and stunted fruit and seed production. Scientists have determined

that plants under environmental stress also develop weaker resistances to pests and parasites (Louda & Collinge, 1992). In economic terms this translates into one of the following 2 scenarios:

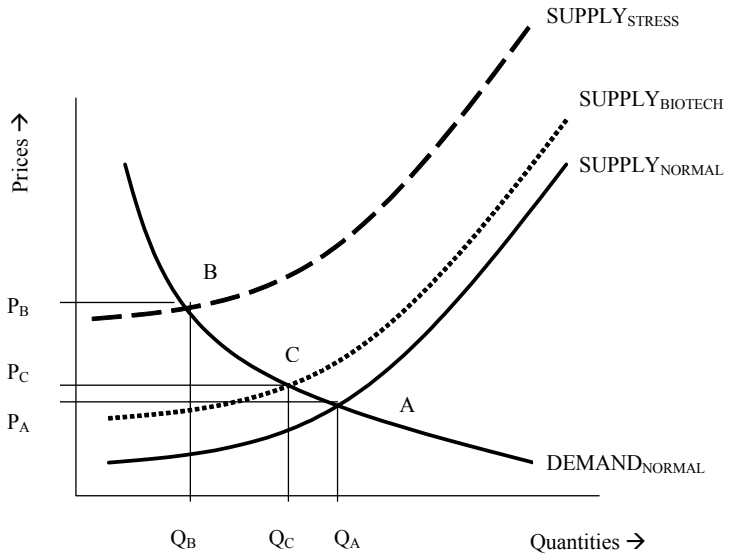
1.	Lower harvestable quantities, or
2.	Higher costs of production (cost of pesticides and other inputs).

Figure 1 is a diagrammatic representation of how environmental stresses can affect human societies, considering the impacts on only those plants that are economically relevant, that is, commercially grown crops, agroforestry, etc. This figure shows a schematic market with prices on the vertical axis and quantities produced / consumed on the horizontal axis. The usual DEMANDNORMAL and SUPPLYNORMAL curves result in a typical market equilibrium (at point A) generating the market clearing price PA and quantity QA.

Given the impact of environmental stresses, a producer has to either settle for low yields from her fields, or provide additional inputs to plants at additional costs. Even the first option places direct (lower profits) and indirect (alternate procurement costs to honor preseason contracts) economic burdens on the producer.

In case the producer opts for a strategy of maintaining yields, there is an additional cost that must be reflected in the supply curve. In the figure this is shown by a new supply curve called SUPPLYSTRESS. For any quantity point, the supplier would need to charge a higher price; hence this supply curve shifts upwards compared to the "normal" supply curve. In reality the new supply curve would be steeper at higher quantity levels, since there would be input cost non-linearities. But, keeping them parallel does not take anything away from the analysis. Although there is no change to market demand, there is now a new equilibrium at point B - given the new supply curve.

Figure 1. Biotechnology innovation to counter environmental stresses



At the new equilibrium (point B), there is new set of market clearing price and quantity, where,

PB > PA	a new higher market price
QB < QA	a new lower market quantity.

In this event, social welfare suffers. Consumers are forced to cutback on their consumption good - which signifies a loss of welfare in any capitalist society. Producers charge a higher price - which run them the risk of product substitution, lower market shares, and possibly lower marginal revenues. The objective of plant biotechnology is to reverse this eventuality to the maximum extent possible, that is

$$\text{Minimize} \quad \frac{\partial W}{\partial S}$$

where, W is social welfare, and S is measurable environmental stress, given by:

W = f (Price, Yield)
S = f (temperature, moisture, soil salinity)

Therefore, biotechnology can minimize $\partial W/\partial S$ by accelerating the natural process of adaptation multiple times with genetic intervention by humans.

Hence, plants are able to adapt to stresses within a few generations as opposed to thousands of generations if left to nature.

The effect this has on the market diagram is to push the supply curve down to SUPPLYBIOTECH. Hence, the new market equilibrium shifts to point C and the market clearing price and quantity move to PC and quantity QC, which lie closer to the normal case. Thus plant biotech represents a net welfare gain for any society that is suffering welfare losses resulting from environmental stresses, and is given by the area within the quadrangle P_BBCP_C.

BIOTECHNOLOGY IN AGRICULTURE AND FOOD

There have been limitless possibilities of application of biotechnology in the agricultural sector. Genetically modified (GM) plants and crops in the agriculture sector offer the potential to increase yields, lower costs and reduce the use of agrochemicals. The financial benefits of using biotechnology have been huge. There are also several environmental benefits. For example, worldwide sales of chemicals used in crop protection totaled about $ 30 billion in 1997. It is predicted that this may decrease by 50% within 13 years because of disease resistance varieties of grains and oilseeds (Lyseng, 1997).

A variety of agricultural products produced by GMOs (refer Table 2) has already been available in markets and more are pending federal approval. There were about 50 million hectares of GM crops grown worldwide in the year 2001 (James, 2001). The early emphasis of ag-biotech was on the reduction of farming costs and the increase of plant yields by developing insect / disease resistance, and herbicide tolerance crops. Insect resistant and herbicide tolerant crops constitute the majority of currently adopted bioengineered crops. In addition to reducing costs, this approach has been

beneficial in reducing the amount of pesticide, insecticide, fungicide applications - thus minimizing human health risks and groundwater contamination.

Environmental benefits of reduced chemical pesticides may appeal to environmentalists. For example, eight GM crops improved crops yields by 4 billion lbs and resulted in savings of 1.2 billion as a result of lower production costs and reduction in pesticide use by 46 million lbs in the US (NCFAP, 2002).

These 8 crops are: insect-resistant corn and cotton; herbicide tolerant canola, corn, cotton and soybean; virus resistant papaya and squash.

Of these eight crops, greatest yield increases have occurred for insect-resistant corn (3.5 billion lbs) and insect-resistant cotton (185 million lbs). Most cost savings have occurred in herbicide-tolerant soybeans ($133 million) followed by herbicide -tolerant cotton (58 million). The use of herbicide tolerant soybean resulted in the reduction of 28.7 million lbs of herbicide (NCFAP, 2002). It is predicted that the greatest increase in yield among GM crops is likely to occur with fungus-resistant barley (1.44 billion lbs).

Similarly, future yields have been projected to increase by 1.42 billion lbs with herbicide tolerant wheat, 1.4 billion lbs with herbicide tolerant sugarcane and 1 billion lbs with potatoes resistant to viruses and insects. As well, fungus-resistant potatoes could eliminate the use of 28 million lbs of soil fumigant. Likewise, it is estimated that rootworm resistant corn could reduce the application of 14 million lbs of pesticides. Overall, the adoption of biotech crops is expected to increase yields by 5.5 billion lbs, minimize the costs by $187 million and preclude pesticide use by more than 91 million lbs annually (NCFAP, 2002).

In the food industry, biotechnology offers a multitude of new and challenging opportunities such as testing for pathogens using monoclonal antibodies, food processing enzymes, health promoting ingredients (also called nutriceuticals), and designer feedstocks with unique functional properties.

It has been argued that although pharmaceutical applications of biotechnology dominate the developments at present - as evidenced by the

rising number of biotech drugs approved each year (Fig. 2) - they will soon be exceeded by the food and agricultural applications (Finely & Scheinbach, 1996). In the food sector, the obvious benefit of biotechnology has been the cost-effective production of valuable enzymes used in the food processing industry. For example, sales of chymosin were about 0.5 billion dollars (Finely & Scheinbach, 1996). Designer fats are another rapidly growing business. Lipases have shown the possibility producing low calorie fats such as caprenin or salatrim at lower costs.

Besides providing food products, plants are also rich sources of insecticides and anti-microbials. Importantly, most of these pesticides and microbials are biodegradable and many are not synthesized by plants until their production is triggered by the pest invading the plant. Scientists have been working to enhance the resistances of a wide range of plants of agronomic value against viruses, bacteria, insects, etc. Virus resistance has been successfully applied to crooked-neck squash.

The objective of this branch of plant-biotech is to replace the use of toxic chemical pesticides with biological compounds that are synthesized by plants thereby reducing environmental degradation. Herbicide tolerant crops such as soy, corn, sugar beet, and rapeseed have already been developed. Hence, herbicides like glycophosphate can be applied to kill weeds without affecting these crops. Since glycophosphate is degraded by soil organism, the end result is a no residue pesticide (Finely & Scheinbach, 1996). Corn has been genetically modified to produce a toxin that kills the corn borer but not other insects or animals, and excluded the need to use insecticide.

It is important to develop stringent standards for this industry to ensure that toxin levels synthesized by plants do not exceed the levels harmful to living organisms in par with the conventional pesticides industry. Although the debate on toxicological risks of synthetic chemicals versus the pesticides produced by transgenic plants is unavoidable, the transgenic pesticide has an obvious advantage because it is produced only when needed and affect only a target pest population. While producers benefit by having lower labor and pesticides costs, consumers benefit through the lower cost of the product and better health and environmental safety. Consumers, however, may not initially realize the cost benefit since companies add

monopoly premia to the products to recover investments in R&D (Finely & Scheinbach, 1996).

Table 2. Applications of ag / food biotechnology

Examples of current ag and food biotech products	Expected future products from biotechnology
♦ Milk from cattle receiving bST	♦ Rapid growing salmon
♦ *FlavrSavr* tomatoes	♦ Improved tomatoes
♦ Improved cherry tomatoes	♦ High solids tomatoes, potatoes
♦ Carrots	♦ High stearic rapeseed oils - shortening and frying
♦ Sweet mini-red peppers	
♦ Chymosin cheese	
♦ Aspire- natural fungicide	♦ MCTs from rapeseed
♦ Nisin - cheese protection	♦ Low saturated fats from rapeseed
♦ Pest resistant corn, wheat, cotton, potato	♦ Pest resistant rice

Plant-biotech is making major inroads in enhancing agronomic performance traits of plants. For example, genes associated with resistance to drought, cold, salinity and other environmental stresses, have been identified. Yields will be improved dramatically by transferring such genes to other plants (transgenic plants) that lack the natural ability to withstand drought, cold, salinity, etc.

To realize the scope of biotechnology in the agriculture sector, investments in research and development are very crucial. Since biotechnological products are well suited to international trade and commerce, companies willing to invest in biotechnology always look to the international market to recover their investments. Therefore, the decisions on investments in biotechnology products are guided by considerations such as international trade barriers, regulatory constraints, etc. Existence of market imperfections can undermine the incentives for investment in ag-biotech (Klein et al., 1998).

There are four requirements for achieving the best return on investment in biotechnology research. First, the product should demonstrate

profitability and easy access to farmers. The product must primarily be appealing to the consumer (e.g., *FlavrSavr* tomato has distinct commercial advantage since it improves shelf life and flavor), and environmental health is only a positive externality of this process.

Second, there should not be long delays in governmental approval and testing requirements. Third, biotechnology products must be protected by intellectual property rights. In the face of a weak intellectual property rights regime, companies may find their investment risky. Fourth, biotechnology products must have a secure passage to international markets.

For biotech products to succeed in the market, enduse benefits should be communicated to consumer. *FlavrSavr* tomato has been well accepted by consumers in California because of its improved flavor benefit. In contrary, milk produced by using bST initially did not do well in the markets due to little perceived consumer benefits. Furthermore, scare tactics used by advocacy groups succeeded in dissuading the public in using the milk produced by cows receiving bST. To have a level playing field for biotech products, efforts must be made to communicate the benefits and safety to consumers.

Higher yields, higher quality, and lower cost of production notwithstanding, the promises of ag-biotech have been tempered by risks that come with genetic manipulation. There are serious concerns regarding the ultimate impact of biotechnology in food and agriculture. One major problem with transgenic food products is the inability to assess the long-term effects of these products in the short-term. Little is known about the long-term toxic buildup and environmental effects of transgenic products.

The possibility of gene contamination due to genetic manipulation between and among species has worried consumers and many critics. It is a very complex task to keep genetically modified grains from natural seeds. It is also difficult to control mixing of different plant genotypes in large-scale agriculture. Although the possibility of cross- pollination generally decreases with distance, it is virtually impossible to estimate the distance that ensures zero pollination. Measuring and monitoring has been a major focus in recent years in European and North American agricultural system (Gates, 1996). There is international consensus for carrying out a comprehensive safety

assessment before GM crops are released into the environment and grown commercially in agriculture (Dale & Kinderlerer, 1995). It has been argued that although gene transfer from transgenic groups to wild species is possible, this will not be considered sufficiently harmful on a local scale to prevent the release of genetically engineered crops in advanced Western agricultural systems (Rogers & Parkes, 1995).

Critics often argue that the benefits of biotechnology have been overemphasized while downplaying the associated risks. GM crops can aggravate or alleviate the impact of agriculture on the environment. They can aggravate the problem if they promote monoculture. On the other hand, they can alleviate the impact of agriculture on the environment by targeted genetic control of pest and disease (Dale, 2002). However, claims that GM crops such as herbicide resistant crops offer environmental benefits are rarely supported by a thorough cost-benefit analysis that takes into account all potential environmental impacts (Gates, 1996). Historically, an adversarial relationship has existed between the proponents of plant biotechnology who strive for rapid practical application and non-governmental organizations, consumers and pressure groups that advocate the precautionary principle and fight for more equitable use of new technology and more stringent safety measures (Lindsay, 1995).

There are unlimited opportunities of biotechnology in agricultural and food sector. However, in addition to the technical hurdles, some barriers must be overcome: market imperfections, the issue of who bears the cost for development, and who has property rights for the products, public perception of costs and benefits, and the regulatory environment. The success of biotechnology in the agriculture and food sector will largely be determined by consumer confidence in the safety of biotech products and the capability of producers in dealing with the questions of containment and segregation of transgenic produce with scientific objectivity.

BIOTECHNOLOGY IN FORESTRY

With biotech developments occurring at an unprecedented scale, forestry today stands on the threshold of a promising change. Biotechnology

applications in the forestry sector can be categorized into the broad areas of - vegetative reproduction, genetic markers, and genetically modified organisms (GMOs), or transgenic trees (Sedjo, 2001).

Currently, biotechnology research in forestry focuses on identifying genetically superior trees, propagating trees through tissue culture, improving trees through genetic engineering, protecting forests with biological pest-control methods, and assessing environmental impacts of biotechnology-derived products. Genetic engineering and advanced tissue cultures for cloned seedlings offer many benefits at a time when we depend on natural forests for wood products and other services and their destruction is occurring at a rapid rate. Basic techniques in tissue culture, genetic transformation, and molecular genetics have been applied to forest trees with varying degrees of success. Biotechnological innovations such as herbicide resistance, fiber modifications, lignin reduction and extraction, sterility have yielded unique benefits to the forestry sector. There are both economic benefits such as lower costs and increased availability of wood and wood products as well as environmental benefits such as rehabilitation of habitats, reduced pressure on natural forests from increased productivity, and restoration of habitats in previously unsuitable areas. The application of biotechnology to forestry holds the potential for trees that grow faster, require the use of fewer chemicals in pulp and paper production and thus has less of an impact on the environment.

Today, a majority of biotechnology applications in forestry relate to tissue culture and molecular marker applications. Nonetheless, there is enormous potential for the use of transgenic trees. Specific genes responsible for certain traits can be identified and introduced to the plant genome. For example, the lignin content, type, and form in wood can be altered to assist in papermaking by identifying and modifying lignin genes.

The primary economic advantage of introducing biotechnology in forestry is improved productivity. This can result either from yield increases or cost reduction or both. Wood products derived from plantation forestry have a competitive edge in the market over those derived from natural old-growth forests because of associated cost-reducing technology with plantation forestry. Economic advantages also result from improved traits

such as straight trunks with little branching, disease resistance, low lignin content in wood, etc. Desired characteristics vary according to the enduse of the wood. For example, one set of fiber characteristics is desired for milling and carpentry whereas another set of fiber characteristics is desired for pulp making. Some characteristics are valued for their role in the production processes (Sedjo, 2001). In pulp making, easy breakdown of wood fiber and lignin removal is desirable. Wood value can be increased by customizing the raw materials for specific needs.

A multitude of environmental benefits can be realized from biotechnology (Table 3). The obvious one is the reduction of pressure on primary forests, which are prized for biodiversity and wildlife habitat, by substituting with genetically customized plantation wood. It has been argued by forest scientists that that biotechnology can enable fast growing plantation forests that would help the industry meet demands that have grown by as much as 300 percent in the last 25 years without having to harvest native forests (Roach, 1999).

Biotechnology also plays an important role in ecosystem restoration. For example, wild tree species such as the American Chestnut that has been eliminated by disease can be restored by introducing disease resistant transgenic varieties. Modified tree species with improved drought or cold resistance is useful in providing environmental services in areas where trees are difficult to grow. Carbon sequestration, which is an innovative strategy to help mitigate the anthropogenic greenhouse effect, can be enhanced by afforestation of degraded lands using transgenic trees.

However, the forestry sector is not immune to criticisms surrounding any transgenic technology. Biotechnology innovations raise concerns about bio-safety and effect of transgenic plants on the resistance of pathogens and genetic exchange between domestic and wild populations. For trees, which are not strictly food sources, the question of food safety is not usually raised. However, with increasing use of cellulosic material as filler in food products, the use of transgenic trees may start raising food safety issues. Another concern is the possible gene contamination of wild tree species from transgenic trees. If plantation trees are exotic, then the issue of migration to the natural environment would not arise. In cases where gene

flow to natural environment is a concern, planting sterile trees or varieties with delayed flowering would minimize the likelihood of gene leakage (Sedjo, 2001). If the genes in question are not survival genes, the presence of modified genes, (e.g., genes that affect fiber characteristics, or tree form) in the natural environment will not pose a serious problem because they are unlikely to provide a competitive advantage in survival and therefore do not exert adverse consequences.

Table 3. Economic and environmental benefits of using biotechnology in forestry

Economic benefits	Environmental benefits
♦ Increased productivity ♦ Production cost reduction ♦ Improved specific values such as tree form (straight trunks with minimal branching) , diseases resistance, low lignin content	♦ Reduced pressure to log primary forests due substitution of plantation wood for wood from natural forests ♦ Establishment to protection forests in degraded lands ♦ Establishment of carbon sequestrating forests on sites previously not suitable for forestry

In cases where survival genes are involved, the consequences can be serious. The release of the *bacillus thuringeinsis* (*bt*) gene, which imparts pesticide resistance to plants, into the natural environment would cause a problem if it altered the comparative competitive position of wild vegetation in dealing with pests. Another concern is that pests may adapt to such genetic pest controls through natural selection thereby undermining the long-term effectiveness of the *bt* gene. Since trees generally have long growth periods, it would allow insect populations many generations to develop resistance mechanisms. One strategy suggested to extend the life of transgenic pest control would be to establish "refugia" (places planted with trees without *Bt* gene) that undermine the ability of pests to develop resistance through natural selection (Sedjo, 2001).

Overall, the magnitude of the problem of transfer of survival genes into the environment is determined by the probability of transfer of a survival gene, the scale of transfer, and change in the comparative competitive position in the natural habitat. Considering that trees have long lives, largely undomesticated status, poorly understood biology and lifecycles, and the complexity and fragility of forest ecosystems, planting GM trees may create grave risks (WRM, 2002). One way to reduce the conflict between adversarial groups is to require environmental impact assessment, with full-disclosure of all potential benefits of bioengineered trees and risks including information gap and uncertainties that may have environmental consequences (Lindsay, 1995).

To sum up, biotechnology can address the challenge of meeting demand for wood and wood products with less environmental intrusion. Research done over the years have shown that it is practically possible to obtain trees with new growth characteristics, altered processing capabilities, improved resistance to external threats and commonly valuable traits. Given the far-reaching implications of impact biotechnology in forestry, societal, ecological and economical benefits must be ensured. The application of biotechnology in forest sector should be evaluated for safety and appropriateness. This can be done by bringing together issues related to science and research, industry and commercialization, ecology and environment, and policies and taking a holistic approach to tackle the problem (IFB, 2002).

ENVIRONMENTAL BIOTECHNOLOGY

The area of environmental biotechnology directly addresses specific issues relating to the mitigation of pollution, and extends to conservation including areas like supplying alternate environment-friendly bio-resources and biosensors for assessing environmental health. Specifically, environmental biotechnology makes use of micro-organisms for treatment of toxic and hazardous wastes converting them into harmless substances.

It may be noted that the biotechnology also renders positive environmental externalities from a variety of other functional areas including

food, forest and ag-biotech, by either reducing environmental damage or improving the productivity of an environmental resource. Biotechnology also supplies environmental benefits through sustainable industrial processes or improved industrial ecology. The direct application areas of environmental biotechnology are:

- GMOs to assimilate pollution - e.g., oil eating bacteria, PCB reducing bacteria, etc.
- Environmental monitoring - assess air / water qualities
- MTBE assimilation - microbes that neutralize MTBE (gasoline additive)
- Material and energy inputs - biomass used as energy inputs, biodiesel
- Biocatalysts / bioenzymes - environment-friendly industrial processors
- "Green" plastics - biodegradable materials and biopolymers

Environmental biotechnology also benefits several industries by providing alternate resources and processes, such that these industries can continue to grow while complying with the regulatory regimes.

INDUSTRIAL BIOTECHNOLOGY

To establish sustained growth in the chemical industry, interests in the pursuit of biotechnology has been growing with a view to develop materials with higher information content and improved economics. Many chemical companies such as Dupont, Dow, BASF and Monsanto are involved in creating high-value materials through biotechnology. In the early years of biotechnology development, most of the R&D funding ($10 billion) was devoted to pharmaceutical and agricultural products, like antibiotics, amino acids and enzymes, via fermentation. In the chemical industry, biotechnology has made its presence felt in three ways:

1.	Created new molecular targets for the industry to manufacture;
2.	Provided new catalysts for carrying out chemical unit processes ; and
3.	Provided new and cheap raw materials, sometimes very complex ones which have potential to create new areas of chemistry (Bryant, 1994).

In recent years, industrial bulk enzymes produced by using recombinant microbes have become important input materials for the detergent, paper processing, diary, textile and feed industries. In 1990, the worldwide bulk enzyme production was valued at US $720 million (Nielsen, 1994). Many of these industries require a wide range of chemicals, therefore, it can be expected that the use of enzymes will continue to grow. Recently, superior strains of microorganisms have been isolated that provide higher productivity of a desired enzyme, greater thermal stability, or a speedier reaction time. Researchers have developed a fermentation process that avoids multi-step chemical synthesis and produces semi-synthetic L-amino acids. This process is more cost effective since it uses glucose, a relatively low-cost raw material (TI, 2003).

Research and development in the improvement of enzyme properties and function will lead to further displacement of chemicals in these industries. For some amino acids, the method of production has shifted from chemical processes to bioprocesses. For example, acrylamide has been produced commercially by using a third-generation biocatalyst (amino acid) since 1985 by Mitsubishi-Rayon (Yamada & Kobayashi, 1996).With the use of biotechnology it is possible to achieve large-scale commercial production of polymers from lactic acid, which in turn can be obtained from fermentation of renewable sources such as sugars. This shift from chemical to biotechnological processes can minimize potential environmental concerns associated with the disposal of chemical processing wastes while increasing product yield.

In the chemical and materials industry sector, a new opportunity has been opened with the possibility of integration of chemical and materials sciences with biotechnology. Chemists have produced a number of synthetic polymers with wide-ranging functionalities. Similarly, biologists have

succeeded in engineering the production of proteins, polysaccharide, nucleic acid, polyhydroxy alkanoates, etc.

Given the similarities between biopolymers (e.g., protein) and synthetic polymers, a better understanding of the structure and function of synthetic polymers and biopolymers will make it possible to design biomimetics with characteristics derived from the structures of both types of polymers.

In essence, biotech products can have huge impact on materials technology in synthesizing high-information-content materials (Miller & Nagarajan, 2000). Bioprocess is suited to the economic production of such chemicals products. A single, large batch fermentor can be employed to manufacture a multitude of enzymes and antibiotics. Besides lower capital costs, the use of renewable raw materials is another advantage for bioprocessing.

The next phase of successful commercialization of large-scale monomers may involve the manipulation of multiple pathways and genes in a heterologous host, as is the case in the production of 1,3-propanediol (Laffend, 1997). Genomics and array technology can be applied for metabolic engineering thereby reducing the cycle time in the production of robust biocatalysts (Bailey, 1999). A major hurdle that remains in the successful commercialization of bioprocess is how to achieve efficient downstream processing. Since bioprocess is water-based, problems such as high hydraulic loads and biofouling are common. Material recovery will be expensive unless a new separation technology is developed. However, chemical engineering is responding with the development of necessary tools that have proven valuable in the development of biochemical engineering (Miller & Nagarajan, 2000). Emerging technologies such as in situ product-removal and molecular-imprinted polymers will provide novel solutions (Lye & Woodley, 1999). The integration of biotechnology with materials sciences is likely to generate a societal impact similar to that of information technology - since it promises to dramatically expand the scope of material use, both in terms of the size and nature of applications

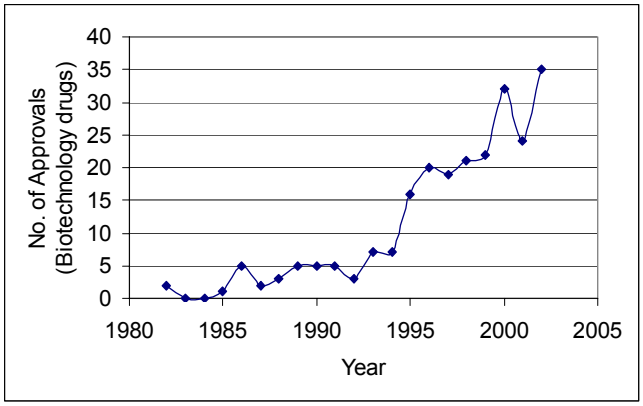
BIOPHARMACEUTICALS

Advances in biotechnology now address the entire gamut of issues relating to the human body, including the requirements of a healthy body, causalities of divergence, measuring the signals of dysfunction and innovative remedial strategies. Some of the sub-areas of this development are (BIO, 2003):

- *Diagnostics* - early, accurate and sensitive detection of physiological change
- *Therapeutics* - biological substances from nature's molecular production system
- *Nutriceuticals* - naturally occurring compounds that have remedial potentials
- *Biopolymers* - biological molecules as surgical aids, prosthetics and for drug-delivery
- *Protein replacement* - like insulin (missing in diabetics), Factor VIII (hemophiliacs)
- *Genetic therapy* - for treating hereditary disorders
- *Cell transplants* - for regenerating organ tissues, cartilages, etc.
- *Immunology* - stimulating or suppressing the immune system
- *Vaccines* - production of antigen
- *Genomics and proteomics* - molecular basis for disease, aging
- *Xenotransplantation* - organ transplants from other species.

This is the fastest growing functional area in the field of biotechnology, and the prospect of biopharma drugs is evidenced from the steeply sloped graph (Figure 2) of approvals since 1995.

Figure 2. Growth of biotechnology drugs



While several new biopharmaceuticals have been developed recently (refer Table 4), there is an exciting new sub-field known as Plant-made-Pharmaceuticals (PMPs). Using plants as factories for growing therapeutic proteins is a low-cost innovation that avoids many of the complications of mammalian cell-culture methods. PMPs are made by tapping the extraordinary ability of plants to manufacture complex proteins, given the appropriate genetic information (Monsanto Protein Technologies, 2003).

Production economics could also favor PMPs over other biopharma options. While classical chemical therapeutics cost about $5 per gram, it could cost between $100 to $500 per gram to make a protein therapeutic using bacterial cell culture, and the price tag could be upwards of $1,000 per gram if mammalian cell culture is used. Using PMPs could drive the cost down by at least 50% compared to bacterial cell cultures. Moreover, there are additional costs resulting from entire batches being rejected for any hint of contamination or minor deviations from strict regulatory standards for storage, etc. These costs are almost eliminated because of the inherent stability of the PMP process.

Table 4. Use of biotechnology in medical applications

Biopharmaceuticals in current development, testing, federal approval	Areas of future biopharmaceutical developments
♦ Human insulin ♦ Human growth hormone ♦ Interferon ♦ TPA ♦ Clotting factor ♦ Serum Albumin ♦ Tumor Necrosis factor ♦ Nerve growth factor ♦ Relaxin ♦ Antigen only (microbe-free) vaccines for meningitis, hepatitis-B	♦ Bio-diagnostics for a variety of applications ♦ DNA vaccines (HIV, malaria, flu, diabetes, Alzheimer's, hepatitis) ♦ Rheumatoid arthritis ♦ Gene treatment for cancer ♦ Delay aging, increase longevity

PROGNOSIS: PERILS, PERPLEXITIES AND ECONOMIC PROMISE

The biggest worry of transgenic production is containment and segregation. Although the magnitude of environmental costs, from accidental breaches of containment, is not clearly defined, it is easy to speculate on the irreversible damages that may be caused to ecosystems directly from a GMO that possesses foreign genes (that it would never have acquired in the natural process) and also the indirect impacts of its interactions with other species. Hence, whatever the product, any breach of containment guidelines will result in a clear, present and future peril.

Adoption of any new technology at the consumer level is a slow process that is encouraged by demonstrations of benefits as well as obvious attention to safety issues by producers and regulatory authorities. The current state of biotechnology is that it neither enjoys a clear exposition of benefits by credible sources, nor is it favored by an unambiguous addressal of risks by producers and regulators. This, along with sensationalization of biotech accidents (e.g., StarLinx corn) - without adequate coverage of follow-up activities and research - has led to a buildup of perplexity in the public

psyche. Important safety and containment initiatives have often gone unreported in the media. For example, the problem of gene leakage into the natural environment can be prevented, by the strategy of introducing only sterile species.

At this stage, it is important to increase the level of public awareness for wider adoption of this technology. This is a multi-dimensional task that needs to be addressed by businesses, industry groups, professionals and regulators alike.

The biggest adoption of biotechnology, so far, around the world has been in the crop sector where GMOs are attractive to producers for their enhanced agronomic properties. For example, GM acreages have gone from less than 5 million acres in 1996 to about 150 million in 2002 - a 30 fold growth in 6 years. There are at least 2 dozen other grain and vegetable crops (e.g., potato, rice, sugar beet, squash) that will be launched in the near future with attributes as diverse as insect resistance, better color, longer shelf-life and delayed ripening (Nap, 2003). There are several economic benefits of such adoptions, including, avoiding pre and post harvest losses to pests, higher value added due to better consumer features and avoided costs of environmental degradation from agrochemicals.

In addition, the rDNA technology is easily extended to biosensors and biomarkers which are bound to prove invaluable in the future. Biotechnology is a powerful tool that will not yield its true potential to society if it is limited to the handful of industries that have currently adopted or experimented with it. Even as viewed from today's state of the art, it holds great promise for new lines of diagnosis and treatment for both genetic disorders and pathogenic ailments. Combined with parallel developments in nanotechnology, it can provide substantial social value from the standpoint of human health alone.

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WORLD WAR I TO WORLD WAR IV: A DEMOCRATIC-ECONOMIC PERSPECTIVE

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ABSTRACT

This paper analyses the idea that the world has not only experienced World War I and World War II but has also fought World War III and is currently waging World War IV. Socio-political and economic factors are applied to the wars of the 20th and 21st Centuries to make the case that these four World Wars should be reclassified and taught as such. The wars of the 20th and 21st Centuries are termed the Wars of Democracy, given that fact that all of the wars involve nations that were democratic in governance against forces that were non-democratic in governance. A simplified classification of the World Wars for Democracy I, II, III, and IV is presented. The non-democratic antagonists are recognized as promoting the causes of Imperialism (World War I), Fascism (World War II), Communism (World War III) and Religious Fanaticism (World War IV). These non-democratic antagonists share commonalities necessary for the existence of their causes. Each non-democratic group found it necessary to identify weaker, easy to persecute, opponents either within or without their countries. These weaker groups were used as threats to the non-democratic causes that needed to be conquered and/or annihilated. Second, each non-democratic protagonist was compelled to constantly imprison, execute and combat oppressed groups within their homeland and conquered borders. These oppressive actions had an economic consequence since the actions caused the non-democratic forces to utilize scarce resources in less advantageous ways. Thirdly, all of the non-democratic forces had fewer resources and productive capacity than the democratic forces. Due to the constant strain on economic resources, it can be reasonably deduced, that the non-democratic forces did not possess

or could not maintain technological proficiency over their enemies. Fourth, the non-democratic forces did not provide a compelling socio-political, economic or religious/moral appeal to their citizenry, outside the realm of physical force, to enable a long-term plan of conquest. Religious fanatics waging World War IV have all four of the above factors working against them.

Misconceptions about world wars are also presented. One basic misconception is about the linear nature of war. War is seen as occurring during a finite period of time and each specific war is occurring as a unique singular event. When actual time lines of various conflicts are studied, one finds that World Wars are overlapping. A second misconception is that wars end in a specific year. World War I is considered to be over as is World War II, however, the socio-political, religious, and economic causes of these wars have not ended. Timelines also demonstrate that World Wars do not end even though the major conflicts of that war may be declared over by major conflict de facto cessation or treaty. Subtle non-violent aggression, often economic in nature, continues on a regular basis, promoted by state sponsored political and economic policies.

Lastly, the paper presents the case that economics is the primal cause behind all wars. A major assumption of this work is that in answering the economic question of 'who gets it' the death and destruction of war is perpetrated. Non-democratic leaderships and those that still follow their causes, to accomplish their ends, all call for the forceful seizure of wealth, by the confiscation of private property or natural resources. Their causes cannot compete in laissez-faire, wealth creation types of markets and procedures, with free democratic institutions, and freedom of religious choice.

INTRODUCTION

It is the premise of this paper that conventional referencing of the wars that occurred in the 20th Century and the referencing of wars that continue into the 21st Century are in need of reformation. This reformation is necessary to obtain a better understanding among the general population

and especially among teachers and students as to the cause and effects of these wars. To justify the reclassification of wars as they are currently studied and presented one needs to look at the democratic and economic aspects involved in these wars. This paper will make the case that the World has not only experienced World War I and World War II but that the United States has also fought and is currently fighting communism in World War III and that we are at the beginning stages of fighting World War IV. In researching this paper, the classification of four World Wars was posited in 2001 (Cohen, 2001). Since Cohen's article appeared other distinguished authorities have recognized that World War IV exists or is close to occurring. Paul Craig Roberts commented on the intent of Middle East fanatics "They will stop at nothing to achieve their goal of World War IV in the Middle East" (Roberts 2003). Daniel Pipes agreed with Cohen in his analysis of World War III and World War IV by stating Cohen, "… captures two points: that the cold war was in fact World War III and that the war on terror is as global, as varied, and as important as prior World Wars" (Pipes, 2003). James Woolsey, former Director of the Central Intelligence Agency stated, "I have adopted Eliot Cohen's formulation, distinguished professor at Johns Hopkins School for Advanced International Studies, that we are in World War IV, World War III having been the Cold War. And I think Eliot's formulation fits the circumstances really better than describing this as a war on terrorism" (Woolsey, 2002). Thomas Hayden went so far as to date the wars, "Many may not realize it but the United States is engaged in our fourth World War. There was World War I (1914-1918), World War II (1939-1945), World War III (The Cold War: 1950-1990), and now World War IV, which started 9-11-01 and expanded with the invasion of Iraq and is now spreading all over the world" (Hayden, 2004). While this paper disputes the fact that world wars necessarily have a finite ending date, it agrees with the basic premise that there are four world wars. If there is a reluctance to admitting that World War III and World War IV has been and is being fought it may derive from the common belief that

World War III is the name given to a hypothetical World War, initially supposed to be fought between superpowers with weapons of mass destruction, including nuclear weapons. Superpower confrontation was deemed to be the major threat in the latter half of the 20th century. This conflict was presumed to result in the extermination or technological impoverishment of humanity…. When asked what kind of weapons World War III would be fought with, Albert Einstein, lamented that 'I know not with what weapons World War III will be fought, but World War IV will be fought with sticks and stones.' Effectively civilization would be ended (Wikipedia, 2004).

These World War III predictions do not meet the realities of what has and is occurring in the world today.

MISCONCEPTIONS OF WARS

It can be conjectured that there are several basic misconceptions about the linear nature of war. War is seen as occurring during a finite period of time and each specific war is occurring as a unique singular event, when actual time lines of various conflicts are studied, one finds that World Wars are overlapping and while one may be at the middle or end stage another World War may be beginning. It could be said that World War II grew out of the ashes of World War I. Germany was decimated economically at the end of World War I and a destitute German people seized on the promises of a better life by following Adolph Hitler. Every war seems to contain the seeds to produce future wars. This is because the true causes of wars have never been defeated. The seeds for World War III and World War IV also grew along side of and out the ashes of World War I. World War III saw the rise of Communism and was assisted by World War I weakening the ability of Czarist Russia to fight the revolt lead by Lenin and Trotsky. On November 6, 1917, the Bolshevik revolution established Communism in Russia. On May 4, 1919 the movement that resulted in the establishment of the Chinese Communist Party began when Chinese students in Peking protested the post-World War I Versailles conference that returned Shantung to Japan instead of China. World War IV was also given impetus as a result of treaties and agreements that were made and implemented after World War

I. On November 2, 1917 Chaim Weizmann persuaded Lord Balfour to implement the Balfour Declaration that established a homeland for Jews in Palestine. This was done as a reward for Jewish support in winning World War I. On August 10, 1920 the Treaty of Sevres divided the old Ottoman Empire into the Middle Eastern Countries of Jordan, Iraq, Syria, Lebanon, and Palestine. (Revolution and Revanchism, 2002). While WW IV cannot be directly related to these events the structure for growing Islamic fanaticism, which has brought about WW IV, was put in place.

Besides the non-linear succession of wars is the misconception that wars end in a specific year. World War I has been declared over as has World War II, however, the socio-religious-political causes of these wars have not ended. Fascist regimes can still be found in various countries throughout the world. All of these aggressive political, economic, and religious ideologies exist where they can, by force, and even though the forces of democracy declare a particular war over it needs to be emphasized that all these wars are still going on today, only without the massive armed conflicts of earlier years. Even today, at the expense of other democratic countries, France and Germany appear willing to work with Muslim religious fanatics and promote their own economic imperialistic designs in the Middle East and Africa. China, Cuba, Korea and various other countries still cling to Communistic ideologies, however, they face constant pressure to change from democratic economic forces. Historians and educators need to correct these time and cause misconceptions in their analysis of World Wars.

CLASSIFICATIONS OF WARS

One could classify the wars of the 20th Century as Wars for Democracy. World War I and World War II were wars that pitted democratic countries against countries that practiced Imperialism (I) and Fascism (II). The author distinguishes between I and II in the fact that I had as basic goals, land acquisition and empire control, while II added the odious concept of a 'superior race'. The lead antagonist Germany and its allies used nationalistic pretenses to obtain land and power. These countries also used nationalism as a pretense to treat weaker opponents and ethnic groups, such as the Jewish

people, as threats or 'outside aggressors' and as such, proceeded to annihilate them. World War III was a war of democratic countries against countries that practiced Communism . World War IV is being fought, today by democratic forces, against disparate individuals, groups, and countries that are practicing theological fanaticism. This fanaticism is directed against religions, races and gender. In a segment, which interviewed 'activist' British Muslims on CNN NewsNight with Aaron Brown, broadcast on August 17, 2004, the interviewed Muslims stated that Islam viewed the ideas of freedom and democracy as impositions of Western cultures and these impositions were not wanted or needed in Islam. How widespread these activists' beliefs are throughout the Islamic religion is unknown but, based on the analysis presented below, the result of World War IV is not going to favor their success.

A simplified classification of the World Wars for Democracy I, II, III, and IV should recognize the non-democratic antagonists socio-political and religious causes. These causes were Imperialism (World War I), Fascism (World War II), Communism (World War III) and Religious Fanaticism (World War IV). The common factors in all of these Wars for Democracy I, II, III and IV was that the non-democratic antagonist shared the same traits. Their cause had to be supported by violence and armed enforcement. Not one of the non-democratic antagonists could have their socio-political-religious ideology exist without force. All demonstrated extreme violence against weak non-violent third parties. Imperialists attacked weaker neighbors and enslaved them while Fascists used the Jewish population as scapegoats. Communists attack capitalist wealth creators and developed class warfare, and Religious Muslim Fanatics specifically target women, Jews and Christians.

Fanatic political ideology or fanatic religious theology cannot exist by allowing free choice. Muhammad would not have been able to make his religion the uniting force it was in the Arab world without force.

"Muhammad, unlike Christ, was a man of violence; He bore arms, was wounded in battle and preached a holy war, jihad, against those who defied the will of God, as revealed to him. His successors perceived the world as divided into, Dar al-Islam - The House of Submission, submission to the teachings of Muhammad, collected in the Koran-and Dar al-Harb, the House of War, which were those parts yet to be conquered"(Ayalon, 1975).

Indeed, by their actions of war and enforced compliance, fanatic Muslim groups signal that they do not believe Islam can exist in societies where free choice of religion exists. Islam, to them, is an endangered religion that must be propagated by threat and murder. In reality there is no difference among the ideology of Fascism, Communism, Imperialism, or Religious Fanaticism. All must use intimidation, 'outside aggressors' as scapegoats, non-democratic leadership, and murderous force to maintain existence. In addition, these non-democratic forces also utilize and draw support from populations most sensitive to the economic disparities within the affected countries.

ECONOMIC ASPECTS OF WAR

In 1832, General Carl Von Clausewitz recognized the political aspect of war when he stated "….war is nothing but a continuation of political intercourse, with a mixture of other means" (Clausewitz, 1873). All wars possess varying emphases on social, political, religious and economic factors. Genghis Khan is quoted as saying "Man's greatest good fortune is to chase and defeat his enemy, seize his total possessions, leave his married women weeping and wailing, ride his gelding (and) use the bodies of his women as a nightshirt and support" (Ratchnevsky, 1991). Khan recognized the rewards of war as the attainment of the enemy's most valuable resources. A more accurate analysis of the wars calls for the introduction of economics as a primal cause of all wars and the addition of democratic infusion into the prevalent religious and socio-political analysis that is commonly presented. It has been accurately stated, "Much of human history has consisted of unequal conflicts between the haves and the have-nots" (Diamond, 1999). When speaking of this economic referencing of the wars of the 20th and 21st

Centuries, it should not be confused with the concept of waging economic war which can be defined as separately (Eatwell, Milgate &Newman, 1987).

All one needs to understand in order to interpret the major economic cause of wars is to understanding that every society must determine three economic questions. These three questions are fundamental in economic teaching. Each country or society must decide first, what to produce, second, how to produce what will be made, and then thirdly, to determine who gets the products and resources that are produced. It is the assumption of this work that it is in answering this third economic question of 'who get it' that leads to the death and destruction of war. At a minimum, this assumption needs to be applied to analyzing any war. The 20th-century and 21st century slaughter of human life in Africa, Ireland, the Balkans and sundry other places have been placed on tribal differences ethnic origin and/or religion. Underlying it all, however, is the economic reason that people are arguing struggling and killing each other. The universal economic reason is that these warring individuals, tribes, or religious groups want to be the ones who 'get it'. The victors of the warring parties want to be the ones that control the factors of production determining who will get the best job positions, who will control the allocation of and obtain revenues from scarce resources, and who will control societal institutions.

This economic interpretation of the cause of wars is reinforced when analyzing key facets of all four World Wars. John Keegan states, "… that the tide of war tends to flow one way - from poor lands to rich, and very rarely in the opposite direction. … It was only when they broke into the rich lands that they were able to accumulate the stocks of provender which made deeper penetration, and eventual conquest, a possibility" (Keegan, 1993). The author would assert that the desire for imperialistic ownership of land and resources lead to the German aggression in World War I. The hyperinflation that occurred after World War I, in Germany between 1920 and 1923, was the result of the misunderstanding about what causes inflation. The German government, during that period, actually believed that they could print enough money to cause an economic expansion that will alleviate the economic problems encountered by their destitute population caused by World War I. They did not see a cause and effect between money supply and

the production of goods and services. This allowed Adolph Hitler an economic window with which to appeal to the people of Germany and develop political strength for his Nazi party.

In 1917 Lenin used the valuable resource decimation and economic destabilization of Russia, because of World War I, as an opportunity to launch the communist revolution. Later, World War III, what is called the Cold War, was justified on the basis of the Marxist philosophy that obtains power by falsely promising a redistribution of wealth by creating class battles between haves and have-nots. " Marx drew the conclusion that the process of mass production in an economic system where a worker did not own the means of production made revolution inevitable" (Keegan, 1993). This revolution occurred worldwide from Eastern Europe, China, Korea, and Vietnam to numerous other countries in Africa, and South America throughout the 20th Century. It is, in the author's analysis, an egregious error to treat disparate regional wars and conflicts, such as Korea and Vietnam, as non-connected unique events. All of these wars should be treated instead for what they actually were; decades long battles against communism making up World War III.

World War IV grew out of middle ages and had its roots in the theological and economic dynamics unique at that time. Under the justification of avenging the assassination of Ramiro I, King of Aragon in 1603 by the Moslems, the idea for the First Crusade,

> *"... was developed in 1073 by Gregory VII who helped an international army to assemble for Spanish campaigning, guaranteeing canonically that any Christian knight could keep the lands he conquered, provided he acknowledged that the Spanish kingdom belonged to the see of St Peter. Papal expansionism, linked to the colonial appetite for acquiring land, thus supplied strong political and economic motives"* (Johnson, 1976).

In furthering the economic explanations for further Crusades, Johnson goes on to explain,

"Most of these people were very poor; they had been unable to obtain land on any lease, or agricultural work during an acute and prolonged labour surplus; they intended to settle. So, of course, did the most determined of the knights. Most of them had no money or lands. ...all the crusaders who settled in the Holy Land were poor men; the rich, ... returned to Europe as quickly as they honorably could" (Johnson, 1976).

The followers of Islam also recognized the importance of gaining wealth to further their faith. "Muhammad, by contrast, had been a merchant, had a keen understanding of the value of wealth, properly used, expected the umma to accumulate it and saw it as a means of doing good, both collectively and individually. He himself raided the caravan of the rich, unbelieving merchants of Mecca, and spent the loot to further his cause. That was the example that his holy warriors followed in their assault on the rich kingdoms of Byzantium and Persia" (Keegan, 1993). It can be conjectured that the fanatical members of the Islamic population are driven by the concept involved in answering the economic question of 'who will get ownership, control and use of valuable resources' just as Muhammad did. The leadership of this Islamic radical faction certainly has economic power designs just as the leadership of imperialistic Germany in World War I and its aligned nations, the Axis powers of World War II, and the U.S.S.R in World War III. These leaderships and those that still follow their causes, to accomplish their ends, all call for the forceful seizure of wealth, whether in the form of private property confiscation or natural resources. Their causes cannot compete in laissez-faire, wealth creation types of markets and procedures, with free democratic institutions and freedom of religious choice.

CONCLUSIONS

Diamond notes, in the long view of the history of war that, "… what makes patriotic and religious fanatics such dangerous opponents is not the deaths of the fanatics themselves, but their willingness to accept the deaths of a fraction of their number in order to annihilate or crush their infidel enemy. Fanaticism in war, of the type that drove recorded Christian and

Islamic conquests, was probably unknown on Earth until chiefdoms and especially states emerged within the last 6,000 years" (Diamond, 1999). This fanaticism can be seen in all of the four World Wars. While the degree of fanaticism is not easily estimable, what is discernable is that World Wars in the last two centuries have a socio-political, a religious/moral, and an economic component. The only unanswerable question is how much the fanatic forces are driven by nationalistic and/or religious devotion and how much they are driven by economic attainment of wealth and power.

To better understand the wars of the 20th and 21st Centuries, it is the prognosis of this work that a variety of changes need to be made in the analysis and classifications of those conflicts. The first change needs to be the recognition of the major conceptual philosophies that caused the wars. These major conceptual philosophies, while intermixed within each war were, Word War I - Imperialism, World War II - Fascism, World War III - Communism and World War IV - Religious Fanaticism. The second change needs to be greater recognition and analysis of the economic incentives that drove and drives the perpetrators of these World Wars. Without wealth and the access to it, it is the author's conjecture that, power cannot be maintained for any substantial period of time. The third change that needs to be made is the idea that world wars occur one after the other in linear time progression. This linearity, in actuality, does not occur. Timelines show that these wars can occur simultaneously with major conflicts of one war occurring in one sector of the world while the conflicts of another World War is taking place, sometimes, in very close proximity. The causal philosophies of the World Wars can be given the opportunity to take root and grow during or in the near aftermath of other wars. Timelines also demonstrate that World Wars do not end even though the major conflicts of that war may be declared over by major conflict de facto cessation or treaty. Subtle non-violent aggression, often economic in nature, continues on a regular basis, promoted by state sponsored political and economic policies.

World War I, World War II, World War III, and World War IV can be classified as the Wars for Democracy. In the final analysis, there is no difference operationally, between Imperialism, Fascism, Communism, or Religious Fanaticism. These World Wars were instigated by non-democratic

forces that came to power by force and can only be maintained by force. The recognition of four World Wars is not easily discernable because each had radically different formative and procedural characteristics. These wars do not become readily comprehensible in classification until one formulizes within them the unifying factors of economics and democracy. When one analyses the results of World War I II and III, one finds that losers (to date) of those wars had a variety of socio-political and economic factors that allows one to reasonably predict the outcome of World War IV. First, each vanquished foe had less economic resources and productive capacity than the victors. Each non-democratic group had to find weaker, easy to persecute, opponents either within or without their countries. These weaker groups were used as threats to the non-democratic causes that needed to be conquered and/or annihilated. Second, each non-democratic protagonist was compelled to constantly imprison, execute and combat oppressed groups within their homeland and conquered borders. These oppressive actions had an economic consequence since the actions caused the non-democratic forces to utilize scarce resources in less advantageous ways. Thirdly, due to the constant strain on economic resources the non-democratic forces could not maintain technological proficiency over their enemies. Fourth, the non-democratic forces did not provide a compelling socio-political, economic or religious/moral appeal to their citizenry, outside the realm of physical force, to enable a long-term plan of conquest. Religious fanatics waging World War IV have all four of the above factors working against them. It may reasonably be concluded that by promoting democratic processes and providing economic incentives, which induce wealth creation, the outcome of World War IV will favor the democratic forces. History has shown that no ideology, religion, or race has ever been successful in world conquest. It can also be reasonable to conclude that, given the economic resources possessed by the democratic forces involved in World War IV, the fanatical religious forces will fail.

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