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EQUALIZING EXCHANGE: A STUDY OF THE EFFECTS OF TRADE LIBERALIZATION

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ABSTRACT

It has been quite broadly documented that, historically, there has not been widespread convergence in levels of income across countries. This paper addresses the question of whether the behavior of cross-country income differentials over time, within a specified group of countries, might be affected by the removal of trade barriers.

The analysis focuses on the evolutionary period of the European Economic Community, which is characterized by a specific timetable for the removal of trade barriers. This liberalization is shown to be strongly related to a significant income convergence that took place between the members of the Community. The evidence indicates that, until their trade became more liberalized, the income differentials between the countries of the EEC behaved very much like the income differentials between the industrialized countries today. After the onset of freer trade, the EEC countries achieved a reduction in income disparity that exhibited a marked similarity to the income convergence that occurred between the states of the U.S. This came about despite the fact that inter-state migration is considerably more widespread and unrestricted than are labor movements within the European Community.

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I. INTRODUCTION

In 1969, the French economist Arghiri Emmanuel wrote a paper on what he termed the "unequal exchange" which resulted from the "imperialism of trade." He postulated that the equalization of real wages, which stems from free trade, leads to efficiency losses, and to a "widening of [the] gap between rich and poor nations."[1] Emmanuel argued that countries, especially those that are less developed, should be aware of this result, and should take it into consideration when deciding their trading policies.[2]

As the global economy becomes increasingly integrated, the need to explore the effects of trade liberalization on incomes is becoming ever more important. The objective of this paper is to empirically examine the behavior of cross-country income differentials over time, within a specified group of countries, and to investigate how they might be affected by the removal of trade barriers.

Motivation and Evidence

It has been quite broadly documented that, historically, there has not been widespread convergence in levels of income across countries. Romer (1986) offers empirical evidence that a country's rate of growth appear to be positively related to its level of development, observing that more developed countries tend to grow faster than less developed nations. Baumol's (1986) work supports these types of results, finding no tendency towards convergence among the countries in his overall sample.[3] Lucas (1988)

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[1] Samuelson (1975) referred to Emmanuel's proposition as "reformulated Marxist theory."

[2] Others (such as Singer, 1950; Myrdal, 1957; and Prebisch, 1964) have also questioned the ability of poorer countries to reap the rewards of unrestricted trade with countries that are better off. They argue that productivity improvements resulting from trade are distributed differently in developed countries than in those that are less developed, which leads to a deterioration in the terms of trade of the poorer countries.

[3] It should be pointed out that Baumol reported convergence in the levels of productivity among sixteen industrialized nations since World War II. However, De Long (1988) responded that Baumol's outcomes were due to sample selection problems resulting from a choice of *ex post* industrialized countries rather

also refers to the general lack of correlation between income levels and rates of growth. Romer (1989) further substantiates these findings with his augmentation of Kaldor's stylized facts. Among the prominent features of the data that he reports on, are: (1) "in the cross–section, the mean growth rate shows no variation with the level of per capita income", and; (2) "Growth in the volume of trade is positively correlated with growth in output" (pg. 55)

This paper focuses on the interaction between these two "facts". The experience of the European Economic Community (EEC) provides a very useful arena for examining the effects of freer trade on incomes. Its attractiveness, particularly during its evolutionary period, is primarily due to the fact that the EEC exhibited significantly increased trade, while exhibiting negligible improvements in migration flows.

An examination of the EEC also alleviates, to a great degree, the question of sample selection, which has been one of the weaknesses in the recent, empirical, income convergence literature. The standard, and somewhat arbitrary, method of selecting cutoff points for determining group size, as well as composition, is of paramount importance (as De Long pointed out) in the calculation of income differentials. A case may be made for either convergence, *or* divergence, depending on which countries one chooses to include in one's sample.

The European Economic Community, however, represents a fixed grouping of countries[4] created with the goal of eliminating trade restrictions among its members. To isolate trade's impact on cross-country income disparity, the behavior of the Community's income differentials *during* the period of liberalization may be compared to their pre-liberalization years, as well as to other benchmark groups that vary in their degree of openness[5].

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than an *ex ante* grouping.

[4] The size of the EEC remained constant for a decade and a half.

[5] If one subscribes to the idea that trade is a cogent force that can induce a reduction in income

A formal agreement creating the European Economic Community was signed over thirty years ago, in 1957, between six countries[6] in Europe. The bulk of the economic integration by the original members of the Community took place during a ten year span, called the *transition period* (lasting from 1959 until 1968), that, as far as shocks to the world economy are concerned, was relatively tranquil.[7] Studies by El–Agraa (1985), and Jensen and Walter (1965), report that the removal of trade barriers resulted in significant increases in the volume of intra–EEC trade. On the other hand, creation of the European Economic Community did not result in the unrestricted migration envisioned by its founders. Collins (1975) and Mayes (1985), as well as reports of the EEC Commission itself,[8] indicate that each of the six countries imposed considerable limitations on labor movements.

To get an idea of the relationship between the income differentials within the European Economic Community, and the *timing* of its trade liberalization, it is useful to examine the behavior of the annual cross-country standard deviations of the logs of per capita incomes.[9] The annual dispersion of real per capita income is plotted in figure 1, along with the important dates in the integration of the EEC.

Creation of the ECSC, the first of the three communities, in 1951, was accompanied by a 16 percent reduction in the standard deviation (σ). From 1954 to 1958, σ behaved in

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differentials, as appears to be the case within the EEC, then a natural continuation of this study (which is presently being undertaken) would be to examine the convergence issue on a regional basis, rather than through the partitioning of the world by income levels, as is common in the literature today. This is based on the premise that, as a nation opens up to trade, it will initially increase trade with its neighbors, rather than with other nations of similar wealth which might be over–the–horizon. It should be noted, however, that the regional approach would also be subject to the same sample selection problems that plague the income approach.

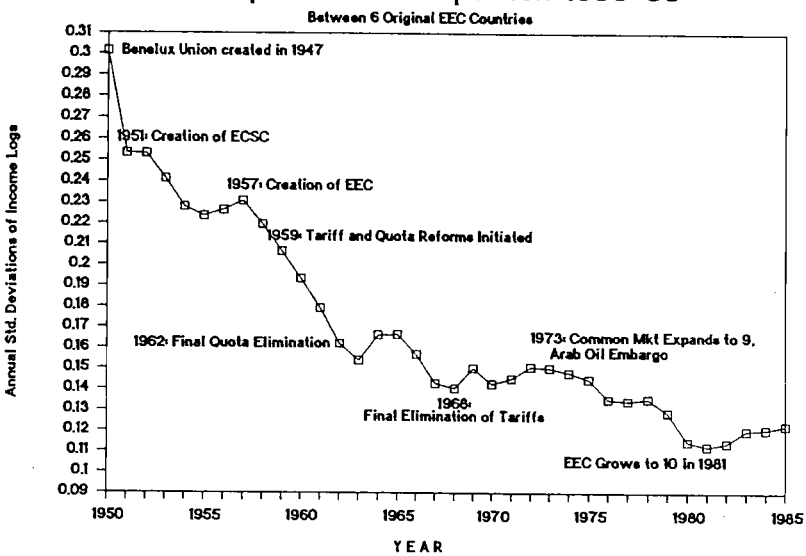
[6] France, West Germany, Belgium, the Netherlands, Luxembourg and Italy.

[7] The formation of the EEC was preceded, in 1947, by the creation of the Benelux Union (formed by Belgium, the Netherlands and Luxembourg), and by the establishment of the European Coal and Steel Community (ECSC), in 1951, by the members of the Benelux Union together with France, Germany and Italy.

[8] EEC 3rd General Report, para. 284

[9] Data source: Summers and Heston (1988).

Figure 1


Per Capita Income Dispersion: 1950-85
Between 6 Original EEC Countries
Annual Std. Deviations of Income Logs
0.31
0.3
0.29
0.28
0.27
0.26
0.25
0.24
0.23
0.22
0.21
0.2
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.1
0.09
1950
1955
1960
1965
1970
1975
1980
1985
YEAR
Benelux Union created in 1947
1951: Creation of ECSC
1957: Creation of EEC
1959: Tariff and Quota Reforms Initiated
1962: Final Quota Elimination
1968:
Final Elimination of Tariffs
1973: Common Mkt Expands to 9,
Arab Oil Embargo
EEC Grows to 10 in 1981

a cyclical manner. In 1959, the internal trade barriers began to be eliminated. That year, σ broke below its previous plateau and headed downward until 1962, the year that all remaining quotas were abolished. The next 3–4 years saw a stabilization around this lower level of income disparity. From 1965 to 1968, there occurred further, albeit moderate, reductions in the degree of income dispersion. In mid 1968 came the end of the transition period, when the last vestiges of internal tariffs were removed.[10] This was followed by several years of cyclical behavior around this level of income dispersion.

The results of this graph appear to indicate a strong relationship between the removal of trade barriers and reductions in the degree of income disparity across EEC countries. The overall fall in the σ's can also be shown by regressing the standard deviations on time (T) for the years 1950–85. This yields[11]

$$\hat{\sigma}_t = \underset{(39.38)}{0.2484} - \underset{(-14.26)}{0.0042}\, T_t \qquad R^2 = 0.857$$

The outcome indicates a significant reduction in per capita income dispersion between the six member-countries of the European Economic Community. This strongly contrasts with the non-convergence, and even divergence, that appears to be the rule in the other studies cited earlier.[12]

The question is, are these results due to an historical accident, or do they stem from the movement towards economic integration by the EEC countries? If it is the latter that

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[10] It should be pointed out that while "official" barriers were phased out, non–tariff barriers would sometimes be substituted instead. Trade in agricultural products was also exempted from some of the measures which governed the rest of the internal EEC trade. The bottom line, however, is that these aberrations were not strong enough to completely cancel out the general liberalization effects on the income differentials.

[11] t–statistics in parentheses

[12] Using cointegration techniques, Bernard and Durlauf (1990) conclude that, while they can find little evidence of convergence among 15 industrialized countries, there does appear to be significant convergence among a European subset of six of these countries (of which four were original members of the EEC, and one joined later).

is behind the convergence, then what is the mechanism that might lead to the reduction in income differentials?

The assumption of diminishing returns to capital leads to the convergence predictions of the standard neoclassical growth theory (Solow, 1956 and 1957; Cass, 1965; Koopmans, 1965). In the absence of factor movements, free trade alone may contribute to a reduction in factor price differentials across countries. That is the conclusion of the factor price equalization theorem, which states that under certain conditions, free trade in commodities will not only equate commodity prices, it will also result in the equalization of factor prices.

Economies of scale may also lead to convergence. Romer (1987, 1990) provided a theoretical framework which illustrates how growth rates in a closed economy may vary directly with its market size. This was followed up by Rivera–Batiz and Romer (1989) who formulated a model that explores the impact that international trade may have on technological change and growth. They conclude that scale effects can indeed have an important positive effect.[13]

Jovanovic and Lach (1990) posit that income inequality among countries is due to differences in the rate that countries implement new technologies. They state that varying speeds of technology diffusion can account for large amounts of variation in levels of GNP. The question, in this context, is, what determines the rate of diffusion?

Dollar, Wolff and Baumol (1988) suggest that there exists "strong circumstantial evidence that technology diffusion through trade in goods and international investment ... [has] played an important role in the convergence of productivity levels" (pg. 44). Baumol (1986) describes the diffusion of technology argument as follows. If a company develops a technological breakthrough, there is increased pressure on its competitors to duplicate the results, or suffer. If there exists free trade, then this pressure to improve extends beyond

[13] The findings of these models support earlier work by Haberler (1959), Caves (1965), Michaely (1977), and others.

the original country's borders. The diffusion process is most effective between countries that produce similar goods.

This argument ties into the *trade-creating* vs. *trade-diverting* literature from the field of international economics. Specifically, the formation of customs unions is considered to be welfare improving if their existence promotes trade-creation. Among the primary dynamic effects of these types of unions are: economies of scale, which are likely to result from the enlarged market; increased stimulus to investment (to take advantage of the enlarged market, and to meet expanding competition); *and* increased inducements to develop and utilize new technology (*i.e.* the sink or swim factor described by Baumol).

An examination of the European Economic Community's evolutionary period should provide an indication of whether these forces are able to bring about convergence in levels of income.

Methodology

It is important to establish, from the outset, the boundaries of this paper. Its primary purpose is to provide a descriptive account of the relationship between trade and income disparity, within the context of a specific setting. No attempt is made here to broaden the theoretical motivations (mentioned above) of why such a relationship should exist. The contribution of this paper is solely within the realm of empirically ascertaining whether such a linkage can be shown to exist.

The following sections pursue the liberalization-equalization issue from the perspective of developments that occurred within the EEC. Section two details the main features of the EEC trade liberalization, including specification of the dates when restrictions on trade were relaxed. Section three examines the changes in income differentials that have occurred as a result of the freer trade. This includes a comparison of post-war behavior to the period beginning in 1870 and ending prior to the Second World

War. Also analyzed, are the income differentials between the next three countries to join the Community. The section concludes with a comparison of the EEC with opposing benchmark cases. The first of these is the United States, where there are relatively no barriers at all on commodity flows *and* labor movements between states. At the other end of the spectrum is the cross-country case, where commodity and labor movements are restricted. Since the EEC's primary success has been in the removal of tariffs and quotas, while progress in the sphere of labor migration has been much less substantial, this intermediate case is useful in pinning down the contribution of free trade in promoting the convergence of incomes.

The fourth section studies the effects of liberalization on the trading behavior of the countries involved. The goal is to determine the extent to which the formation of the European Economic Community led to trade creation, and to examine the relationship between the trading behavior of the EEC members and the behavior of the income differentials within the Community.

Section five summarizes the results.

II. The Process of Liberalization

Internal Tariffs

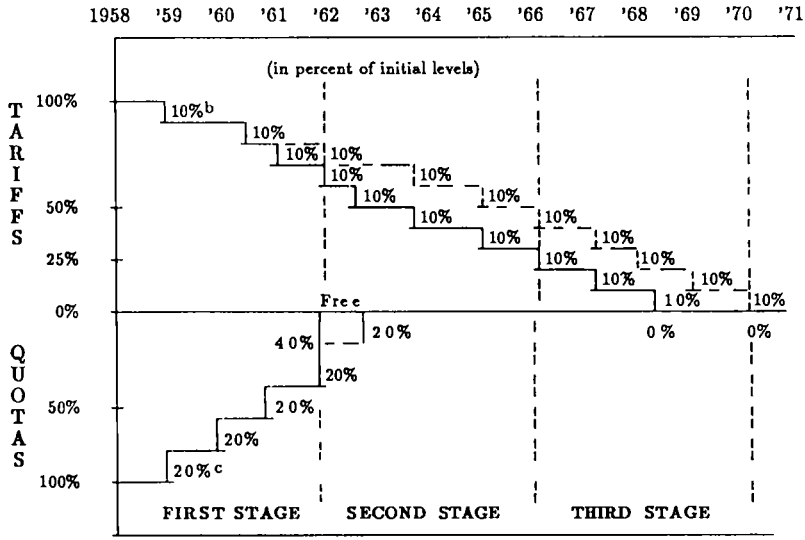
The Treaties of Rome, signed in 1957, provided a relatively strict timetable for the elimination of internal tariffs. This *transition period*, as it came to be called, was to last twelve years. Its actual length could vary with the member countries having the leeway to shorten it, should they so desire, or lengthen it. However, a ceiling of 15 years was placed for the removal of all internal tariffs.

The transition period was to be split evenly into three stages, each lasting four years. Internal tariffs were to be reduced in a series of 10 percent drops at specified dates,

FIGURE 2

REDUCTION OF INTERNAL EEC TRADE BARRIERS[a]

(Scheduled Transition Period: 1/1/58 — 12/31/69)



(All internal EEC quotas are non–discriminatory)

— — — Scheduled by Rome Treaty
——— Actual Changes

[a] This graph was first used by Jensen and Walter (1965). It was slightly altered here to include information from Overton (1983).

[b] First reduction — 10% on *all* goods. Other reductions — 10% *average*, as little as 5% on any *one* good.

[c] 20% *average* quota increases, as little as 10% on any *one* good.

with minimum targets set for the end of each stage (figure 2). However, the customs union was completed eighteen months ahead of the Treaty schedule, with July 1, 1968 signaling the end of the transition period. On this date, all remaining internal tariffs were completely lifted and the *Common Customs Tariff* replaced the national customs duties in trade with the rest of the world.

The main difference between the EEC tariff reductions and those imposed by GATT is in their scope. While GATT negotiations produced tariff cuts on a commodity-by-commodity basis, the EEC lowered them on all goods at once, in a step by step progression specified in advance at the time of the signing of the Treaties of Rome. This across–the–board form of tariff reductions did in fact have some exceptions, particularly regarding some agricultural products which were exempted from the overall timetable and instead were governed by special regulations. Internal agricultural quotas, as well as minimum prices, came to be replaced by variable levies.

It should also be noted that only the initial tariff reduction of 10 percent in 1959, and the final removal of all customs duties in 1968, were to be applied uniformly across all goods. Countries were given discretion in the degree of reduction they imposed on each commodity, as long as they averaged the 10 percent drops agreed upon in the original timetable. They were further required to reduce the internal duties on each product by at least 25 percent and 50 percent, at the end of the first and second stages of the transition period, respectively.

Internal Quotas

The quota system in Europe evolved and expanded during the depression years of the thirties, with two forms of restrictions being imposed. Those of the first type, called *discriminatory* quotas, bias the allocation of import licenses to certain favored countries. These are in contrast to the second form of quotas, labeled *nondiscriminatory*, or "global", quotas, where a ceiling is placed on the total amount of a commodity which may be

imported from all trading partners, without regard to the exporting country.

The Rome Treaties decreed that all nonagricultural quotas between member countries become nondiscriminatory as of 1959. Furthermore, intra–EEC quotas were simultaneously increased by 20 percent on average, and by a minimum of 10 percent for any given product. Additional 20 percent increases were mandated, so that complete elimination of quotas would be achieved by the end of the transition period.

The actual rate of quota removal, depicted in the lower half of figure 2, was even more accelerated than originally planned, due to the brisk pace of integration between member–countries. Quota restrictions on industrial commodities were completely lifted by the end of 1961, with a few exceptions.

The following year, limits were imposed on the minimum levels of agricultural quotas, and all quotas between members became nondiscriminatory. Several were replaced altogether by a system of variable levies whose purpose was to compensate for price differences between the importing and exporting EEC countries.

III. The Behavior of Incomes Within the EEC

For convergence to occur, there must exist a negative relationship between a country's initial level of per capita product and its per capita growth rates. In a sample of 98 countries, Barro (1989) calculated a correlation coefficient of 0.09 for the years 1960 through 1985, indicating that average annual rates of growth (ROGs) are uncorrelated with initial levels of income. In the case of the EEC, however, this relationship was found to be significant (at the 1% level), with a correlation coefficient of –0.945 for the years 1950 to 1985.

It should be pointed out that tests of this type, are very sensitive to the

specification of a periods beginning and end.[14] To get around this problem, it is helpful to investigate whether the rates of growth of each country differed significantly from one another on an *annual* basis.[15] Let

$$\Delta x_{it} = \text{ the growth rate of real per capita GDP of country } i \text{ in year } t$$

The idea is to fit Δx_{it} on country effects and year effects as follows:

$$(1) \qquad \Delta x_{it} = \beta_1 + \sum_{j=2}^{6} \beta_j D_{jt} + \sum_{m=1952}^{1985} \gamma_m D_{mt} + \epsilon_{it} \qquad \begin{matrix} t = 1951,\ldots,1985 \\ i = 1,\ldots,6 \end{matrix}$$

where: D_{jt} = dummy variable for country j

D_{mt} = dummy variable for year m

This equation permits three hypotheses to be tested.[16] The first, and most important for the goal at hand, is the null hypothesis that the countries' mean growth rates are equal to each other, *i.e.* that $\beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$. By using a Chow-test, it is possible to reject this hypothesis at a 1% significance level (table 1). The second null hypothesis requires a Chow–test for the joint significance of the year dummies, while the third is an F–test of the significance of the regression equation. In both of these cases, the null

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[14] Quah (1990) argues that cross-section regressions of growth rates on initial levels of income suffer from Galton's fallacy, suggesting that a negative coefficient (for the initial income variable) is insufficient evidence of convergence.

[15] Note that, in order to show convergence, it is not enough to prove that rates of growth are significantly different. It must first be established, as was done here, that there exists a negative relationship between income and rates of growth. Suppose that, there was a positive, rather than a negative, correlation. Significantly different ROGs would then indicate *divergence*, not convergence.

[16] A linear regression using two groups of qualitative (0–1) variables is equivalent to computing a two–way analysis of variance.

TABLE 1

ESTIMATION RESULTS OF EQUATION 1

Checks of Joint Significance	$F(q,ndf)$	F—Statistic
Nations Only	$F(5,170)$	4.612 **
Years Only	$F(34,170)$	5.737 **
Nations & Years	$F(39,170)$	5.592 **

** Significant at the 1% level

hypotheses are rejected at the 1% level.[17]

Having established that there has been significant income convergence within the European Economic Community from 1950 to 1985, the objective of the next two parts of this section will be to relate this reduction in income differentials more decisively to the actual removal of trade barriers. This is done by: (1) contrasting the post-war period to the years preceding World War II; (2) examining the income differentials of the three countries that joined the Community in 1973.

Comparison of Post-War Period with Earlier Trends

While it is apparent that a significant amount of convergence transpired during the post-war years, there still remains a question concerning the reliability of these results in confirming the existence of a significant link between the removal of trade barriers and the reductions in income differentials. For example, is it possible that the post-war convergence was due to the shocks induced by the Second World War? In other words, was the post-war fall in the disparity of incomes due primarily to the rebuilding of war-shattered economies, or, alternatively, was it a continuation of a long-term convergence trend? Verification of either of these scenarios would weaken the case for a link between trade liberalization and income convergence.

Two alternative propositions will be examined here.

1. Per capita incomes of the countries which would later comprise the European

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[17] In addition to the estimation of equation 1 on all six nations, an outlier analysis was performed for the period 1950–85 to determine whether any one country could have been the cause for rejecting the first null hypothesis. None of the countries (including Germany) was found to have been the lone source of this convergence.

Additional tests were conducted to determine whether incomes converged at the bilateral level as well. The results of these tests corroborate the multilateral outcomes of the equation 1 analysis. In 8 of the 15 possible pairings the poorer country grew significantly faster (at the 5% level) than the wealthier nation. When the significance level is increased to 10%, the poorer country grew significantly faster in 13 of the 15 pairings. Non–parametric Wilcoxon matched-pair signed rank tests confirm these results.

Economic Community had been converging during the three and a half decades preceding the war.

2. The per capita income differentials of the future member-countries were relatively small during the pre-war years, with WWII creating the disparity that would be later reduced.

Using Maddison's (1982) data, it was possible to analyze these alternative propositions by calculating the standard deviations for the founding members of the EEC[18] all the way back to 1870. The standard deviations displayed in figure 3 measure the income dispersion without Germany. The country is omitted to show that the post-war convergence which took place was not simply an outcome of German rebuilding following the war.[19]

The behavior of the σ's clearly indicates that, during the pre-war years, *neither* of the above two scenarios appears to hold. In fact, the dispersion of real per capita income was fairly stable from 1870 until the mid-1950's, with the σ's fluctuating between 0.194 and 0.268. Only after the onset of trade liberalization did the standard deviations exhibit a level change (the minimum level, of 0.104, was attained in 1968, the final year of the transition period).

The results of running equation 1 on the rates of growth of the five countries, for the period 1900–1938, appear in table 2. During these years, the country dummies are jointly

[18] The data includes all of the original EEC countries, with the exception of the smallest, Luxembourg. From Summers and Heston's data, however, it can be shown that exclusion of Luxembourg does not appreciably alter the main conclusions enumerated above. Therefore, its omission here should not be considered too serious a problem.

[19] Germany was always among the poorest, in per capita terms, of the six countries. Today, it is one of the wealthiest countries in Europe. As a result of its heightened prosperity, it might be claimed that all of the convergence that has been witnessed within the EEC is due to the behavior of Germany. Thus, its exclusion should bias the results away from convergence.

Figure 3

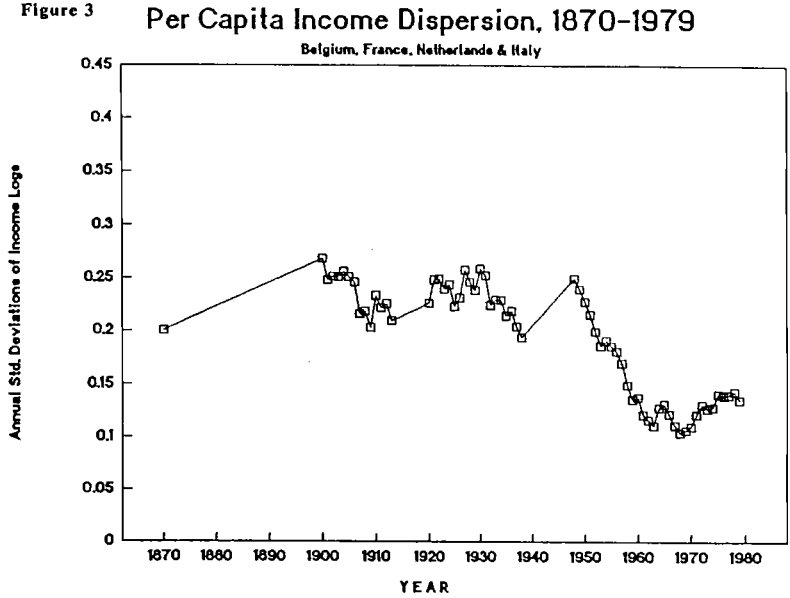

TABLE 2

ANALYSIS OF JOINT SIGNIFICANCE: 1900–79

Checks of Joint Significance	1900 — 1938	1950 — 1979
Nations Only	$F(4,124) = 1.351$	$F(4,116) = 3.887$ **
Years Only	$F(31,124) = 2.531$ **	$F(29,116) = 4.968$ **
Nations & Years	$F(35,124) = 2.396$ **	$F(33,116) = 4.838$ **

** Significant at the 1% level

insignificant, indicating that there did not exist a significant difference between the countries' growth rates. Only the year dummies are significant as a group. When the equation is run on the years 1950 through 1979, the results support the earlier outcomes of significant country dummies, drawn from the Summers and Heston data.

Income Behavior of the Three New EEC Member-Countries

The focus, until now, has been on the founding countries of the European Economic Community. The significant post–war convergence of the Six raises interesting questions relating to the impact of trade liberalization on income convergence. Would it be possible to reproduce similar convergence results for the next three countries to join the EEC?[20] And if these countries exhibit a reduction in income differentials after eliminating trade barriers amongst themselves, would this behavior be any different than their pre-liberalization behavior?

Figure 4 displays the annual standard deviations of the Three. The σ's actually *increased* until the mid sixties. At that time, the Three began to relax the trade restrictions that existed among themselves (as well as with the Six). This coincided with a stabilization in the σ's. In 1973, the Three became full members of the European Economic Community. That year, the degree of income disparity among them began to fall at a rate equaling the rate of decline in the σ's of the Six.[21] The rise in the income differentials of the Three during the eighties coincides with an increase in the σ's of the Six. This could be due to expansion of the EEC to include Greece (and later Spain and Portugal), as well as heightened benefits to LDCs.

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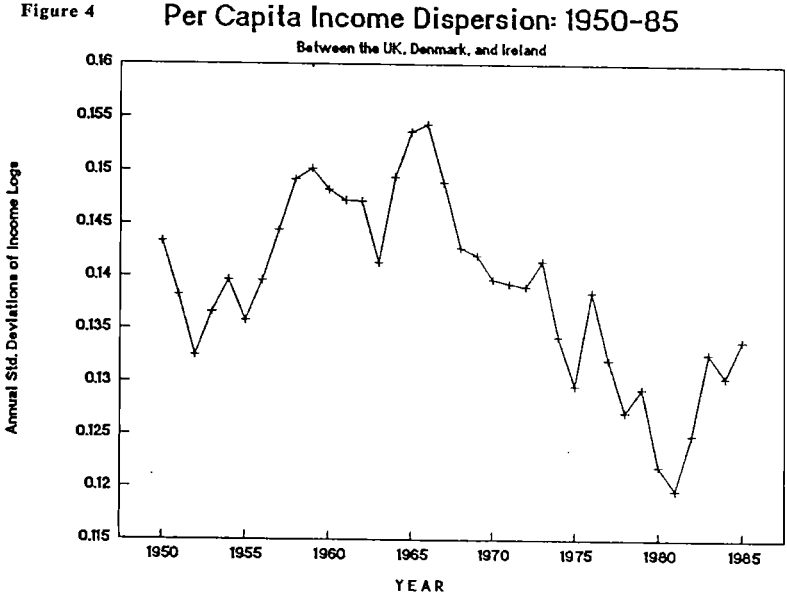
[20] Ireland, Denmark and the United Kingdom

[21] As an interesting aside, the rates of average income growth of the Six and of the Three were compared from 1950 until 1985. The ROGs of the Six surpassed the ROGs of the Three by a significant amount until 1973, the year that the EEC expanded to include all nine countries. From 1974, however, there was no significant difference in the rates of growth of the two groups.

Figure 4


Per Capita Income Dispersion: 1950-85
Between the UK, Denmark, and Ireland
Annual Std. Deviations of Income Logs
0.16
0.155
0.15
0.145
0.14
0.135
0.13
0.125
0.12
0.115
1950
1955
1960
1965
1970
1975
1980
1985
YEAR

Comparison of the EEC to Opposing Benchmarks

While the EEC countries have exhibited a significant reduction in the degree of income disparity amongst themselves, this has not been a prevalent feature of the international data. The remainder of this section focuses on a comparison of the EEC to opposing benchmark cases.

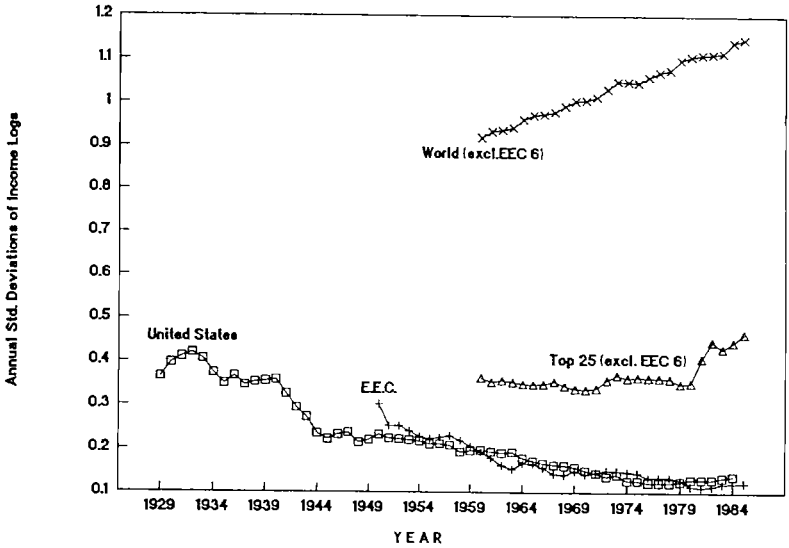
United States evidence will be used as a best–case scenario for what may be accomplished within a completely integrated world economy, where there is relatively unrestricted trade *and* migration. At the other end of the spectrum, is the cross-country, or *world* case, where there exist curbs on the mobility of goods and factors between countries. The EEC provides the intermediate case that depicts a steady liberalization of trade. This places it between the restrictive world case and the free trade, free migration, U.S. case.

In 1950, the average income dispersion in the European Economic Community was 30% higher than in the U.S., with a standard deviation of 0.30 in the EEC, compared to 0.23 for the United States. However, as can be seen in figure 5, the two schedules representing the standard deviations for the United States and the EEC became very similar, as the income differentials between member–countries and U.S. states moved in almost lock–step fashion. This is in contrast to the degree of income inequality across the 107 market economies (marked "world" in the figure).

Comparing the EEC outcomes to the various cross–country groupings yields some very interesting results. While the norm for most of the income groups is divergence (Ben–David, 1990), the high-income groups exhibit fairly stable standard deviations. This is highlighted in figure 5 by the income differentials between the top 25 countries (in terms of 1960 per capita income).[22] This lack of a significant increase, or decrease, in disparity, is

[22] The group of 25 countries used here was determined by looking only at countries with per capita incomes that exceeded at least 25% of the the wealthiest country's per capita income (the U.S.) in 1960. The six members of the European Economic Community, which also belong in this group were excluded from the sample.

Figure 5 Comparison of Income Dispersions, '29-85



very similar to the relatively stable income differentials displayed by the EEC members in the years *before* they began to remove their internal barriers on trade (see figure 3). However, once these barriers were eliminated, the EEC countries achieved the rates, and even levels, of convergence found within the U.S. — despite the fact that inter-state migration was considerably more widespread and uninhibited than were labor movements within the European Community.

This suggests that the removal of trade barriers, and the encouragement of free trade, has been a contributing factor underlying these results. Completely efficient labor markets, while desirable in and of themselves, did not appear to have been mandatory for the achievement of income convergence at the free market level.

The following model may be used to describe the convergence/divergence behavior of each group. Let

$$\frac{Y_{i,\,t+1}}{\bar{Y}_{t+1}} = \left[\frac{Y_{i,t}}{\bar{Y}_{t}}\right]^{\phi} \tag{2}$$

where:

$Y_{i,t}$ = per capita income of country i in year t

$\bar{Y}_{t}$ = average per capita income of the group of countries in year t

The convergence coefficient, ϕ, represents the rate of convergence of country i's per capita income to the group's average income level. Taking logs of equation 2 yields

$$y_{i,t+1} - \bar{y}_{t+1} = \phi\,(y_{i,t} - \bar{y}_{t}) \tag{3}$$

where: $y_{i,t}$ = log of per capita income of country i in year t

This model[23] is used to test how the convergence behavior within the EEC compares to the benchmark cases. Equation 3 was estimated for each group, with the results appearing in table 3. Two-tailed *t*-tests are calculated in each case to determine whether the estimated ϕ's differ significantly from one (the standard deviations for the ϕ's appear in parentheses).

Since all the coefficients appear to differ only slightly from unity (albeit significantly in many of the groups), it is useful to calculate the number of years (x) that are required for the average disparity to be cut in half (when $\phi < 1$). This is done by using the formula[24]

$$x = \frac{\log 0.5}{\log \phi} \tag{4}$$

When ϕ is greater than one, the number of years needed to *double* the degree of disparity was calculated by using substituting log 2 into the numerator of equation 4.

The convergence coefficient for the EEC countries is not significantly different from unity during the pre-war years, implying that the disparity between the countries remained relatively constant. During the post-war years, however, there occurred a very significant convergence, with the strongest decline in the income disparity taking place during the transition period. It is interesting to note that the half-life during the transition period was nearly identical to the half-life of the U.S. convergence over the past 55 years.

The *world* was examined as one large group, as well as in smaller breakdowns of the wealthier countries. The group of 107 countries displayed a propensity towards doubling their average income gap within 94 years. The top 25 industrialized countries exhibited no

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[23] Squaring both sides of equation 3 and then summing over the countries gives the relationship between σ_t and σ_{t+1}, where ϕ represents the rate of decline (if $\phi < 1$) in the groups average level of dispersion (when the group averages are geometric means).

[24] The half-life may be calculated as follows. If $Q_{t+1} = \phi Q_t$, then $Q_{t+x} = \phi^x Q_t$. Since $Q_{t+x} = .5Q_t$ by definition, then $.5Q_t = \phi^x Q_t$, or $.5 = \phi^x$. Taking logs of both sides and dividing by $\log \phi$ gives equation 4.

TABLE 3

CONVERGENCE COEFFICIENTS, BY GROUP[a]

	$\hat{\phi}$	N	R^2	t-stat. H_0: $\phi=1$	Half life	Dble life
EEC, 1951–85						
Pre–War, 1900–33	0.9908 (0.0094)	135	0.988	–0.98	75.1	
Post–War, 1951–85	0.9707 (0.0066)	204	0.991	–4.44 **	23.3	
Transition Period 1959–68	0.9494 (0.0103)	60	0.993	–4.90 **	13.3	
UNITED STATES, 1929–84	0.9507 (0.0044)	2256	0.954	–11.27 **	13.7	
WORLD (excl. EEC 6), 1960–85						
All 107 Countries	1.0074 (0.0012)	2675	0.996	6.42 **		93.9
Top 25 Countries	1.0027 (0.0056)	625	0.981	0.47		260.9
14 Countries[b] (w/o Venezuela)	1.0132 (0.0093)	325	0.973	1.42		52.7
EEC 6, 1960–85	0.9736 (0.0081)	150	0.990	–3.28 **	25.9	
U.S., 1960–84	0.9656 (0.0053)	1152	0.967	–6.51 **	19.8	

[a] Standard deviations are in parentheses

[b] These are the 14 countries with the same per capita income range as the EEC 6 in 1960.

** Significant at the 1% level

significant tendency in either direction, which is quite similar to the pre-war "stability" of the EEC countries.

All 14 countries with per capita incomes below Luxembourg (the wealthiest nation in the EEC in 1960) and above Italy (the poorest) were lumped together as a comparison group that had achieved approximately the same level of development and the same degree of income disparity in 1960 as that which existed within the European Economic Community. This group showed no inclination whatsoever towards convergence over the next quarter century.

The European Economic Community incomes were also regressed on the identical 1960 to 1985 span, as were the U.S. state incomes. Both exhibited significant, and rather similar, convergence coefficients.

IV. Liberalization's Effect on Trade Within the Community

In the previous section, the *timing* of trade liberalization in the European Economic Community was shown to be related to a significant convergence in the per capita incomes of the member-countries. From 1870 until the 1950's, income discrepancy was relatively constant and high, and the countries did not grow at significantly different rates. From the fifties to 1985, there was a significant reduction in the income disparity of the EEC countries. The Summers and Heston data, as well as the Maddison data, indicate that countries' rates of growth differed significantly during this time, with a significant negative correlation between initial levels of income and growth rates. Taken together, the last two results are indicative of a significant convergence in incomes.

The fall in income differentials of the Six during the fifties and sixties contrasted sharply with the increasing disparity of the Three. When liberalization of trade commenced among the Three, income differences within the that group were reduced as

well.

The objective now is to focus on the Community's trade behavior in recent decades, and to determine whether it was affected by the removal of trade barriers, particularly during the decade-long transition period of the EEC.

The motivation behind this section is to construct a variable that is directly affected by the elimination of impediments on trade. Once it is determined that trade behavior accurately reflects the extent of free trade, it is interesting to measure its relationship with the convergence in EEC incomes. This is done in the final part of this section.

To determine whether elimination of tariffs and quotas had any effect on trade, I analyze two types of outcomes that may occur. The first, called *trade diversion*, entails a substitution by imports originating in EEC countries, of imports from non-EEC countries (*i.e.* an increase in the relative share of the countries benefiting from the removal of tariffs and quotas on their exports). The second outcome of liberalization, called *trade creation*, will be characterized by an increase in the overall level of imports into the EEC, relative to the total products of the countries.

Trade Diversion and Trade Creation

As the member-countries of the EEC began to eliminate the existing restrictions on imports between them in the late 50's, the rate of increase in intra-EEC imports consistently surpassed the rate of import growth (ROIG) from the rest of the world (figure 6).[25] This point difference varied from 4 to 9 percent between 1960 and 1972, following a 17.2 point difference in 1959, the first year of the transition period. By 1972, intra-EEC trade comprised approximately one-half of the Community's total imports (figure 10).

Two major events occurred in 1973 that helped bring this behavior to an end. The first was the enlargement of the European Economic Community by 50% and the

[25] Data source: IMF *Direction of Trade* Statistics.

Fig. 6: Differential Rates of Import Change

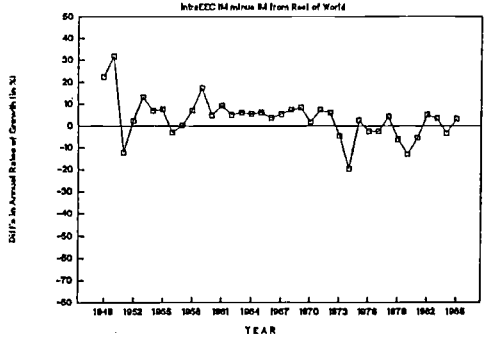


Fig. 7: Differential Rates of Import Change

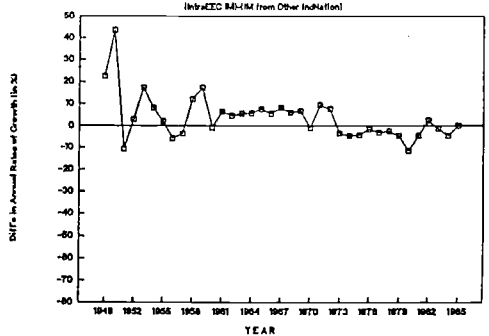


Fig. 8 Differential Rates of Import Change

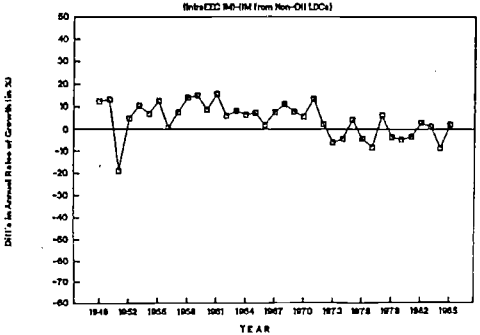


Fig. 9: Differential Rates of Import Change

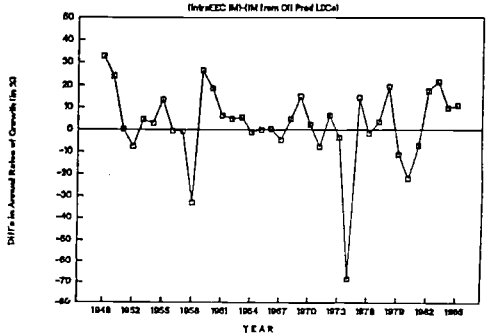
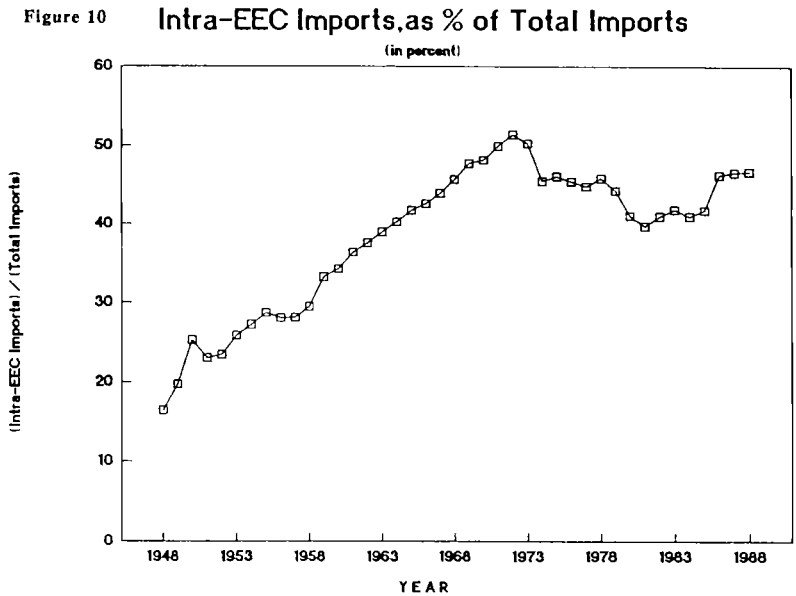


Figure 10


Intra-EEC Imports,as % of Total Imports
(in percent)
(Intra-EEC Imports) / (Total Imports)
60
50
40
30
20
10
0
1948
1953
1958
1963
1968
1973
1978
1983
1988
YEAR

elimination of existing trade barriers with the new member-countries. The second major event in 1973, the OPEC oil embargo, combined with the EEC expansion to create large fluctuations in the point difference during the following years. This point difference alternated between positive and negative values, indicating that intra-EEC trade was no longer increasing its share of total imports.

The effect of EEC expansion may be seen in figure 7, which shows the difference between the rates of growth of intra-EEC imports and the ROIGs from other industrialized countries. Like in figure 6, the point difference during the transition period is quite stable and, with the exception of 1960, always positive. This changed during the seventies as imports from the remaining industrialized countries (which included the Community's new members) consistently outpaced the intra-EEC imports. The variability of this point difference increased during the eighties and was accompanied by a return to fairly equal, on average, rates of import growth.

As in the comparison with the industrialized countries, the pre-seventies intra-EEC ROIG was consistently higher than the ROIG of the non–oil LDCs (figure 8). From the early seventies, this pattern reverts to cyclical behavior around zero (not negative, as in the case of the industrialized countries).

A comparison of intra-EEC ROIGs with the rates of increase in imports from the oil–producing developing countries appears in figure 9. While these rates are fairly equal in general, intra-EEC imports grew at the same rate, or faster, than imports from the oil-producers in nearly every one of the years during the transition period, which extended from 1959 to 1968. Like before, this stands in contrast to the near equality (with the exception of 1974) in ROIGs during the seventies, as well as during the pre-transition fifties.

Closer inspection of the trade data for each of the four groups corroborates the visual evidence. In table 4, the post-war years are divided into three sub-periods: period I covers the pre-transition years, 1949–1958; period II extends from 1959 until the

TABLE 4

MEAN DIFFERENCES (IN %) BETWEEN INTRA-EEC ROIGs AND ROIGs FROM OTHER ORIGINS

(Standard Deviations in Parentheses)

Period	Non—EEC		Developing Countries	
	World	Industrial Countries	Non-Oil	Oil-Prod
I: 1949—58	7.57 (3.77)	8.81 (4.80)	6.30 (2.95)	3.56 (5.36)
II: 1959—73	5.88 ** (1.12)	5.60 ** (1.22)	7.37 ** (1.37)	4.84 ** (2.27)
III: 1974—88	—0.97 (2.14)	—2.36 (1.05)	—0.39 (1.68)	5.58 (7.10)

** Significantly different from zero at the 1% level

enlargement of the Community, and the onset of the first oil crisis, in 1973; while period III runs from 1974 to 1988. Regardless of the group, the second period stands out as the only period when the rate of growth of intra-EEC imports was significantly greater (at the 1% level) than the ROIG of imports from any other source.[26]

While intra-EEC imports grew at faster rates than did imports from other sources, it is important to examine whether this difference was due to trade diversion, or trade-creation. Analysis of the ratios of imports to GDPs provides a good indication of whether EEC liberalization was primarily trade-diverting or trade-creating. Letting M_{it} equal the proportion of imports into the EEC from group i, divided by total EEC GDPs in year t, its behavior during each of the three periods may be estimated by regressing

$$M_{it} = \beta_0 + \beta_1 T_t + \epsilon_t \tag{5}$$

where T_t is time. The results of this estimation appear in table 5, while the actual observations are plotted in figures 11 and 12.

Total imports from the non-EEC world divided by total EEC GDP are compared in figure 11 to the ratio of total intra-EEC imports to GDP. In the pre-transition period, the volume of imports from the rest of the world was stable, at approximately 11% of GDP. During these years, there was a slight, though significant, rise in the intra-EEC imports to GDP ratio. This coincided with the partial liberalization that had already begun between the countries which would later form the European Economic Community.[27]

During the transition period which followed, imports from the rest of the world declined a little, relative to GDP, while the ratio of intra-EEC trade doubled. The rise in

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[26] Bartlett's test for heteroskedasticity confirms that there also exist differences in the variances of each of the three periods, with the second period exhibiting the least amount of variability in each of the cases.

[27] During these years, the BENELUX Union had already been formed, while the first of the three Communities, the European Coal and Steel Community, was created in 1951.

Figure 11

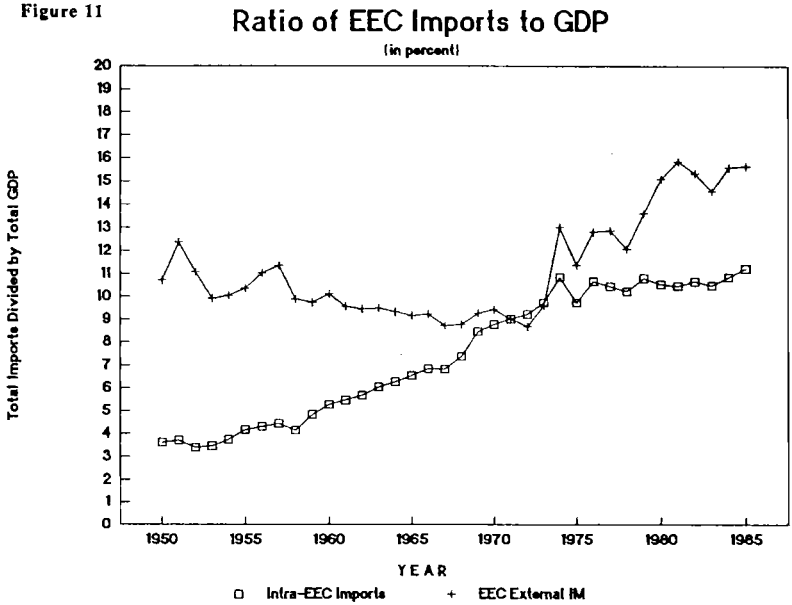


Figure 12

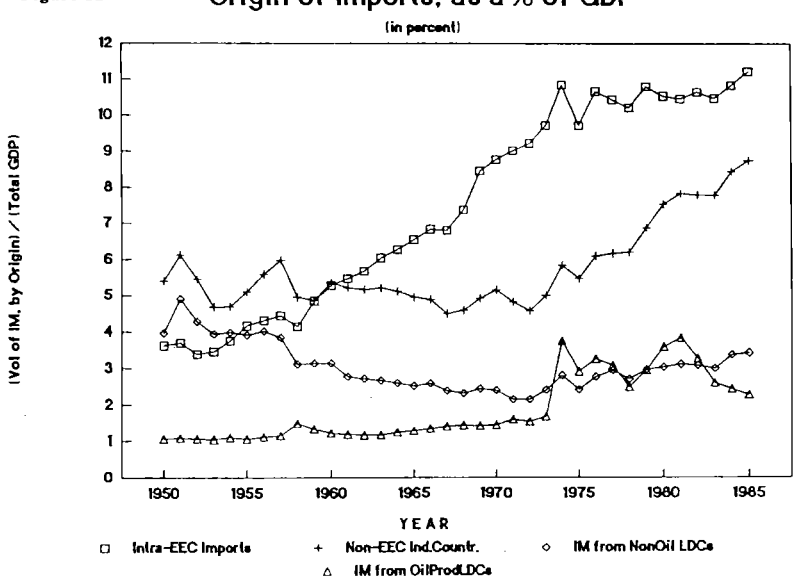


TABLE 5

BEHAVIOR OF EEC IMPORTS OVER TIME

Dependent Variable: Ratio of Total Imports into EEC (by Origin) to Total GDP of EEC

Period	Origin of Imports	Constant	T	N	R^2
1950—1985	EEC	2.685 **	0.258 **	36	0.954
1950—1958		3.317 **	0.115 **	9	0.666
1959—1973		1.179 **	0.348 **	15	0.970
1974—1985		9.038 **	0.050	12	0.238
1950—1985	World (non—EEC)	8.695 **	0.137 **	36	0.397
1950—1958		11.241 **	—0.099	9	0.111
1959—1973		10.184 **	—0.052 *	15	0.348
1974—1985		2.855	0.365 **	12	0.723
1950—1985	Ind.Coun.(non-EEC)	4.374 *	0.075 **	36	0.455
1950—1958		5.456 **	—0.024	9	0.016
1959—1973		5.448 **	—0.029	15	0.248
1974—1985		—1.848 *	0.293 **	12	0.942
1950—1985	Non-Oil LDCs	3.673 **	—0.033 **	36	0.273
1950—1958		4.587 **	—0.118 *	9	0.491
1959—1973		3.577 **	—0.059 **	15	0.809
1974—1985		0.944 *	0.067 **	12	0.741
1950—1985	Oil-Producing LDCs	0.573 **	0.070 **	36	0.661
1950—1958		0.955 **	0.035 *	9	0.459
1959—1973		0.822 **	0.032 **	15	0.782
1974—1985		5.121 **	—0.068	12	0.218

* Significant at the 5% level
** Significant at the 1% level

intra-EEC imports was certainly due in part to import-substitution away from the rest of the world. However, the fact that EEC trade increased annually by 7 times the annual decline in imports from the rest of the world, is an indication that much of the increase was due to trade-creation as well.

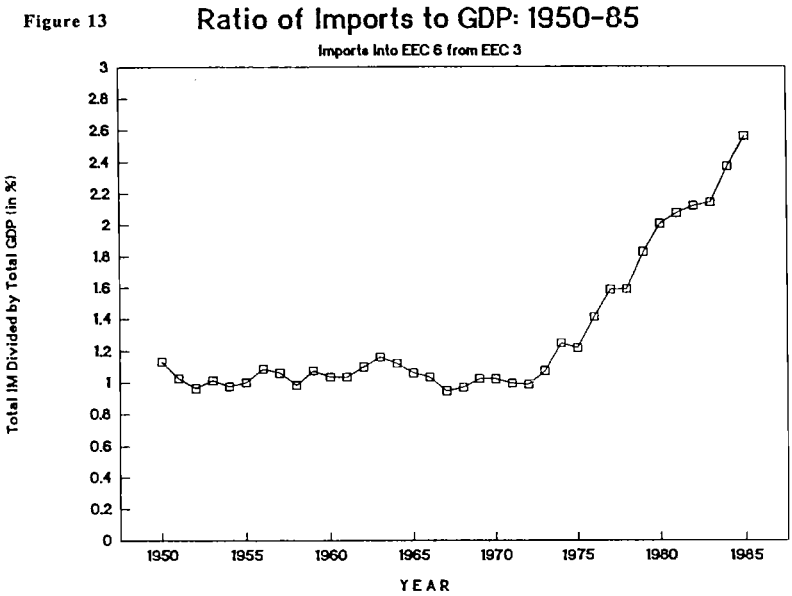
In the 12 years following 1973, when nearly all the barriers on trade between the members of the European Economic Community had been removed, the fraction of intra-EEC trade, out of GDP, stabilized and remained between 10 and 11 percent. This compares with a very significant rise in the ratio of non-EEC imports to GDP, which was due in large part to the liberalization of trade with the Community's new members. The significant rise in imports from the industrialized countries is evidence of this (this point is further discussed below). The less pronounced, but significant, increase in imports from the non-oil producing developing nations coincided with a concentrated effort on the part of the Community to aid these countries through partial and full waivers of many external EEC barriers (through multilateral agreements, as well as under the provisions of the Generalized System of Preferences, otherwise known as the GSP).

Imports from the oil-producing countries experienced a *level* change in 1974. In the years that followed, the import ratio from these countries remained at the higher level, albeit with much greater fluctuations than before.

Freer Trade with the Three New EEC Members

When imports (into the EEC) from the three countries that joined the Community in 1973 are isolated (figure 13), the impact of liberalization is striking. The ratio of imports (from the Three into the Six) to total GDP (of the original Six) was very stable for nearly two and a half decades. Membership in the Community, which came in 1973 and led to the removal of barriers with the Three, contributed to a sharp, and sustained, increase in the Imports/GDP ratio.

Figure 13


Ratio of Imports to GDP: 1950-85
Imports into EEC 6 from EEC 3
Total IM Divided by Total GDP (in %)
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1950
1955
1960
1965
1970
1975
1980
1985
YEAR

Enlargement of the EEC coincided with a general liberalization trend towards other European countries. However, this tendency towards freer trade was much more restricted than the relationship that developed between the Six and the Three, which came to be known as the Nine. This can be seen in figure 14, which displays the rates of increase in the Imports/GDP measure. The figure shows the percent change in each year's ratio versus the the initial ratio in 1950, (*i.e.* the cumulative change). A comparison is made between the imports from the Three and imports from the remaining, non-EEC 9, industrial countries. In both cases, M was quite constant until the mid-seventies, and then rapidly increased. The rise in the non-EEC ratio, which reached 45%, was far outpaced by the growth of the EEC 3 ratio, which climbed to over 120%.

This suggests a very close link between the degree of liberalization and the impact on trade. It should be noted that while many non-EEC European nations benefited from less restricted trade with the EEC, the United States did not enjoy a marked change in the Communities trade policy towards it. This resulted in a very stable Imports/GDP ratio (not shown here) with the U.S., that remained fairly constant from 1950 through 1985.

Trade and the Disparity in Incomes Across Countries

The results of this section have provided a clear indication that trade liberalization has a very significant impact on trade behavior. This effect is best captured by the measure of imports to income. In the case of the European Economic Community's transition period, the link between the timing of liberalization and the increases in intra-EEC trade is striking.

The correlation coefficient between σ_t and M_t is –0.90, indicating a strong negative relationship between the heightened trade and the reduction in income differentials. A graphical depiction of this relationship appears in figure 15. The σ's, which are measured along the left vertical axis, are plotted together with the annual M's, which are measured

Figure 14

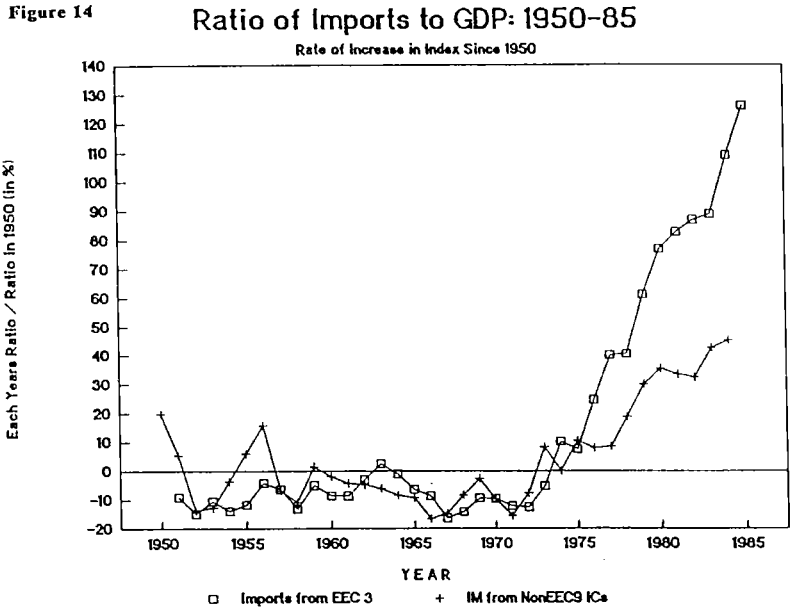
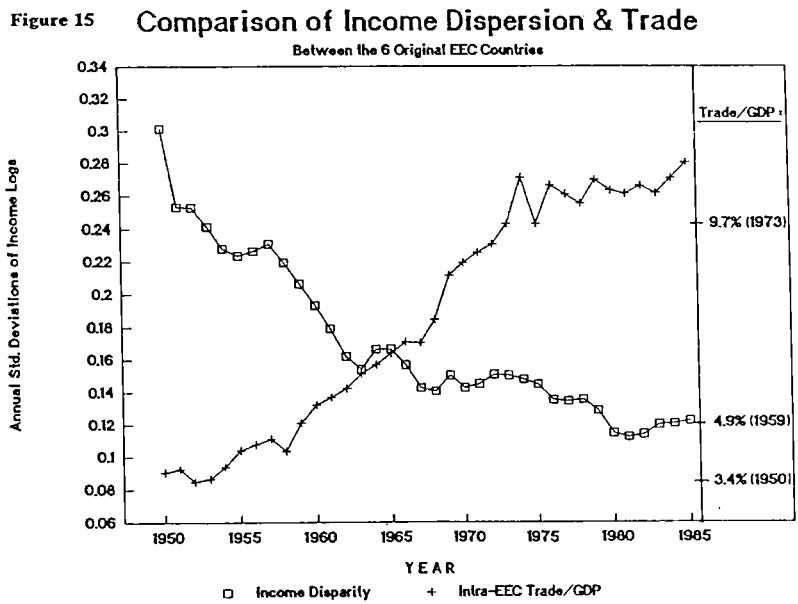


Figure 15



along the right vertical axis.

The cyclical behavior of the two curves during the 1950s appear to be very negatively correlated. The year 1959, which was the first year that barriers began to be eliminated across-the-board, marks a turning point in the behavior of both schedules. Steep changes were accompanied by a relative lack of cyclicability in the two measures. In the seventies, when all intra-EEC trade restrictions had been eliminated, the slopes of the curves moderated somewhat, and the cyclical behavior returned.

It is interesting to note that intra-group trade was also strongly related with income differentials among the three newer members of the EEC, with a correlation coefficient of –0.76 between σ_t and M_t.[28]

V. Summary and Conclusions

This paper examined the proposition that creation of a free trade environment should lead to the types of income convergence results predicted by the neoclassical growth model and the factor price equalization theorem. The focus of this analysis was on the six original members of the European Economic Community.

During the post-war period, the convergence of incomes within the EEC was found to be quite substantial. The annual rates of growth of the Six were significantly different, with a negative correlation between levels of income and rates of growth.

The significant link between trade liberalization and income convergence was then demonstrated in a couple of settings related to the EEC Six, to illustrate that the convergence of incomes was not due to other developments. Standard deviations of incomes were calculated all the way back to 1870 and displayed. This allows for

[28] Direction of trade data between the three newer EEC members is only available from 1954 (as opposed to 1950 for the original Six).

clarification of two major points. First, the income convergence witnessed after 1950 was not due to some earlier, enormous, divergence caused by World War II -- *i.e.* post-war σ's were not returning to some earlier level. A second feature of the earlier calculations is the very stable, and high, levels of the standard deviations between 1870 and the 50's, when the countries began to free the trade among themselves. In other words, until trade liberalization began, there was no noticeable decline in the σ's. Thus, their post-1950 behavior could not be attributed to a continuation of some long–term trend.

In a related example, the σ's of the next group of countries to join the EEC (in 1973) were examined. Not only did the incomes among the three new members fail to replicate the behavior of the original Six and converge during the post-war years, the degree of disparity actually increased until these countries began to remove the trade barriers amongst themselves. After membership in the Community, the income differentials began to fall and their rate of decline became nearly identical to that of the EEC Six.

The focus of the analysis then shifted to other benchmark cases to which the EEC case can be compared. The United States provides an illustration of how an integrated world economy might behave. It is characterized by: (1) a relative absence of barriers on commodity flows and labor movements, and; (2) a central government. These additional degrees of freedom (which are unavailable to sovereign nations) enable the U.S. to provide the best-case scenario for income convergence. The behavior of income differentials at the opposite end of the mobility spectrum, where there are restrictions on the movements of both goods and people, was also examined. The 107 market economies in the sample exhibited significant income divergence. A noticeable lack of convergence was also evident among the world's 25 wealthiest countries, as well among the 14 countries with incomes in the range of the EEC spectrum.

A comparison of the EEC to these benchmarks was then conducted to illustrate how the liberalization of trade can bring about convergence. The pre-war behavior of income

differentials between the countries which would later make up the Community, was fairly constant and high, much like the behavior witnessed for the industrialized countries today. A significant change in their behavior occurred as trade became more liberalized. The rates of income convergence became nearly identical to those observed in the U.S. between states.

The effect of liberalization on trade patterns was very strong as well, with increases in imports from the beneficiary countries shown to be quite significant. Intra-EEC trade increased significantly as a result of the fewer restrictions. This contrasts sharply with the behavior of imports from external (to the EEC) sources, which exhibited very little change. When all barriers within the Community were eliminated, the steady increase in intra-EEC trade leveled off. The link between liberalization and trade was also evident when trade barriers were eliminated on imports from countries other than the founding members of the EEC. Most of this growth in imports was shown to be primarily of the trade-creating variety. The increasingly free trade within the European Economic Community was found to be strongly related to a significant reduction in the dispersion of per capita incomes.

The results in this paper lend empirical support to the hypothesis that trade liberalization has an impact on incomes, even to the extent of bringing about the sort of convergence results attained in the integrated economy case, as exemplified by the United States. In the absence of free trade, however, there is no reason to assume convergence in income levels, as is evidenced by the analysis of the world case.

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