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*Competitive Shocks and Industrial
Structure: The Case of Polish
Manufacturing*

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Abstract

A large number of countries have recently experienced competitive shocks: sudden increases in the role that market forces play in determining the evolution of various industries. In this paper, we study the implications of Poland's competitive shock for three elements of the structure of that country's manufacturing sector: entry, concentration, and foreign presence. Our analysis underlines the importance of explicitly identifying the specific distortions built into initial (pre-shock) industrial structure and lags in their adjustment to more competitive conditions.

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Over the last decade, many countries have implemented policies that have suddenly and significantly increased the role of market forces in determining the evolution of various industries—policy phenomena that we refer to as *competitive shocks*. Such shocks supply a particularly interesting perspective on the effects of increased competition on industry structure and business strategies because they permit first-difference analyses that can control, to some degree, for sociological and other factors that are supposed to change only in the longer run.

Competitive shocks often involve both external and internal liberalization, although the emphasis and sequencing vary from one locale to the next. External liberalization refers to the relaxation of restrictions on trade and foreign investment flows, particularly inbound ones. The elements of domestic liberalization are more varied but can range from reduction of government-imposed barriers to entry, mobility, and exit, to deregulation of domestic price/non-price competition, reform of input markets (particularly capital and labor), privatization and even renunciation of socialism (accompanied by the creation of new institutions).

The scope of a competitive shock can also vary: it can largely be confined to a single industry in a single country (e.g., U.S. airlines in the late 1970s); encompass many of the industries in a particular country; or have a global impact on specific sectors (e.g.; global telecommunications in the late 1990s and beyond). Although at least some of the analytics should be similar, we focus on competitive shocks at the national (multi-industry) level. Such shocks are reshaping the economies of many less-developed countries and provide a natural experiment for exploring the effects of increased competition in a cross-industry context.

For evidence of the prevalence of competitive shocks at the national level, it is useful to start with external liberalization as coded by Sachs and Warner [1995], who classify countries into closed vs. open trade regimes based on the extent of tariff and non-tariff barriers to imports, the black market premium for hard currency, and whether the state monopolized major exports and

was socialist. Excluding backsliders, 58 countries in their sample went from being closed to being open between 1960 and 1994. Converts since 1985 alone numbered 48, and included Mexico (1986), Turkey (1989), Poland (1990), Brazil (1991), South Africa (1991) and India (1994). Figure 1 traces the frequency of trade liberalization events year by year since 1960.

From the internal side, one can think of many cases of competitive shocks at the national level that do not make it onto this list of 58, in most cases because external liberalization has lagged internal reforms. The erstwhile socialist bloc supplies a number of cases that fail to meet Sachs and Warner's [1995] trade-based criteria but that have engaged in significant internal reforms: China and Russia are particularly important cases. Many non-socialist countries also fall into the same category: Bangladesh and Egypt are two relatively populous examples. Overall, more than five dozen countries, accounting for at least one-third of the world's population and one-sixth of its GNP, seem to have experienced some sort of competitive shock, external or internal, since 1985.

In this paper, we make a start at studying the microeconomic implications of this sweeping economic policy experiment by analyzing the evolution of industrial structure in the wake of a competitive shock in a particular country, Poland. Poland's competitive shock has several features that recommend it as a case study. First, there was a clearly delineated policy change: Poland's "big bang," initiated on January 1, 1990, involved simultaneous liberalization of foreign trade, foreign direct investment (FDI), prices, and regulations on entry, exit, and factor markets. Second, the policy change appears to have been significant enough to lead to rapid changes in the structure of Polish manufacturing. Finally, relatively current data on Poland's manufacturing sector (at the two-digit level) are publicly available.

Our analysis of the Polish case underlines the importance of explicitly recognizing nonequilibrium dynamics in modeling and estimating post-shock patterns of structural change. In this kind of "generic environment," it turns out to be very important to identify the specific distortions built into initial (pre-shock) industrial structure and lags in their adjustment to more

competitive conditions. Hypotheses that are sensitive to initial structural distortions and lags in their adjustment fare significantly better as predictors of structural change in Polish manufacturing than do hypotheses that treat competitive shocks as having the comparative static effect of shifting observed elements of industry structure from one market equilibrium to a second, (parametrically) different one.

The rest of this paper is organized into five sections. Section 1 provides background information on and a brief description of Poland's competitive shock. Sections 2 through 4 analyze, respectively, changes in entry rates, concentration levels and foreign presence in Polish manufacturing. Section 5 concludes with suggestions for further research on the microeconomic effects of competitive shocks.

1. Poland's Big Bang

After the collapse of its communist government in 1989, Poland implemented one of the more aggressive reform programs seen anywhere in recent years. Poland's competitive shock, implemented on January 1, 1990 and known as the 'big bang,' encompassed macroeconomic stabilization, microeconomic liberalization, and measures designed to reform the institutional structure of the economy. The big bang program led to rapid transformation of the Polish economy. After a sharp decline in (officially measured) output during 1990 and 1991, Poland was the first of the post-socialist economies to resume growth. By 1993, private enterprise accounted for more than 50% of national output and nearly 60% of employment, foreign direct investment had exploded, trade had been reoriented from the Soviet-bloc CMEA (Council for Mutual Economic Assistance) countries towards western ones, and the annual inflation rate had declined by a factor of twenty, to approximately 38%.

This section briefly describes the condition of the Polish economy prior to that country's competitive shock, profiles the competitive shock itself, and discusses that the data available (so

far) on its implications for the structure of Polish manufacturing. Much more elaborate treatments of the first two topics are available from a number of other sources.¹

Conditions Prior to Reform

Poland's pre-1989 socialist economy was characterized by tight state control of all economic activity, through either direct ownership or regulation. State-owned enterprises accounted for approximately 82% of output and 71% of employment (GUS, 1990). The great majority of private economic activity was in the agricultural sector, which had never been successfully collectivized. Comprehensive price controls severely distorted activity in the small, non-agricultural private sector.²

Poland's pre-1989 economy suffered from at least three structural distortions. First, output was severely skewed toward heavy industry. In particular, the share of manufacturing in GDP was much higher than in low income EU countries. Thus, manufacturing accounted for 45% of Polish GDP in 1988, compared to 21% of Greek GDP (1988) and 25% of Spanish GDP (1987). And the service sector was proportionately smaller, at 21% of GDP in Poland versus 24% of GDP in Greece and 44% of GDP in Spain.³

Second, levels of industrial concentration were extremely high. Binczak (1992) found that the distribution of concentration ratios in manufacturing industries for Poland in 1987 was much higher than the distribution of such ratios in France (1969) or Japan (1970). The results of his comparisons of C4 ratios in Poland and France and C5 ratios in Poland and Japan are summarized in Table 1. Although the analysis suffers from several shortcomings,⁴ the contrast is striking. In Poland, the distribution of concentration ratios was skewed strongly toward high levels, while in France and Japan, the distribution across levels was more even.

¹ For the condition of the pre-shock economy, see for example: Lipton and Sachs (1990a); Berg and Sachs (1992); Sachs (1993); Balcerowicz (1993a, 1993b); and Blanchard, Froot, and Sachs (1994). The data on pre-shock conditions is from GUS (Główny Urząd Statystyczny, 1990, 1995). Balcerowicz (1994, 1995) discusses the elements of reform in detail.

² Balcerowicz [1994] reports that prior to reform, more than half of all sales took place at administered prices, including the prices of goods and services as important as food, housing, and industrial products.

³ GUS (1990)

⁴ Binczak did not control for differences in market size or breadth of industry definition—Poland had a somewhat smaller economy than either France or Japan and Binczak uses a larger number of industrial classifications in Poland.

Table 1
Distribution of Concentration Ratios in Various Countries
(% of industries)

| Concentration Ratio | Poland-1987 (C4) | France-1969 (C4) | Poland-1987 (C5) | Japan-1970 (C5) |
|---------------------|---------------------|---------------------|---------------------|--------------------|
| 90% and over | 39 | 18 | 47 | 27 |
| 70 - 89.9% | 21 | 11 | 23 | 26 |
| 50 - 69.9% | 19 | 11 | 15 | 22 |
| 30 - 49.9% | 14 | 21 | 11 | 19 |
| 10 - 29.9% | 7 | 32 | 4 | 5 |
| less than 10% | 0 | 7 | 0 | 1 |

Source: Binczak (1992)

A final structural distortion was that Polish managers devoted significant resources to non-economic aims. In state-owned enterprises in particular, production, distribution, and investment decisions were often made for political, not economic, reasons. Several authors have highlighted this aspect of socialist economies.⁵ This led to high administrative costs and extremely low productive efficiency.

By late 1989, the Polish economy was in crisis. The inflation rate for the second half of 1989 was in excess of 2,000%; the black market exchange rate for the zloty was more than eight times the official rate; and there were severe shortages of almost all consumer goods.⁶

The Balcerowicz Plan

After the quasi-free elections in August 1989, Leszek Balcerowicz was appointed Deputy Prime Minister and Finance Minister. He had complete responsibility for economic policy and spent the fall of 1989 designing a stabilization and liberalization strategy. The plan—designed to promote macroeconomic stabilization, microeconomic liberalization, and institutional reform—was launched on January 1, 1990. The major reforms can be grouped into five broad categories. First, private economic activity and prices were deregulated. This provided incentives to entrepreneurs, helped rebalance supply and demand, and reduced the market power of large state

⁵ See for example, Pinto, et. al [1993], Olson [1992], and Krueger [1992].

⁶ Balcerowicz (1994).

monopolies. According to Balcerowicz, the share of free prices increased from 50% of the volume of sales to about 90% in early 1990. Almost all shortages and queues for consumer goods disappeared within a month.⁷

The second set of reforms addressed international trade. The aim was to use foreign trade as a way to broaden the market, introducing competition from abroad in order to mitigate the market power of state-owned firms. This involved currency reform—the zloty was massively devalued; the exchange rate fixed and unified; and the zloty made convertible for most current account transactions.⁸ In addition, tariffs were lowered and standardized. Finally, many long-standing restrictions on foreign business transactions were removed.

The third set of reforms were aimed at establishing macroeconomic stability. The fiscal deficit was eliminated, moving from a deficit exceeding 6% of GDP in 1989 to a surplus of 3.7% in 1990. Negotiations were initiated with the London and Paris Clubs to reduce Poland's foreign debt. These negotiations eventually led to debt forgiveness equal to approximately 50% of the country's \$42 billion external debt. Finally, nominal interest rates were set above the inflation rate so that credit allocation would be based on price, not politics.

Fourth, the commercial code was revised. This had two aims: to facilitate market interactions and to force state-owned enterprises to act more like commercial entities. Toward this aim, private and state-owned firms were made equal in terms of contract law; the tax system was reformed; bankruptcy procedures were established, and state-owned enterprises were required to produce financial statements on a regular basis.

The final element of the plan was privatization. Balcerowicz took a broad view of privatization, which he defined as shifting commercial activity from the state to the private sector. This shift could occur by privatizing state firms, through the sale of state-owned assets to private owners, or by organic growth of the private sector. The privatization of large enterprises

⁷ *Ibid.*, p. 161.

⁸ The official rate per U.S. dollar fell from 1.340 zloty to 9.500 zloty between September 1989 and January 1990.

has proceeded slowly and, through the first five years of reform, organic growth has proven to be the most important mechanism for transforming the economy.⁹ This, in turn, has led to tremendous cross-industry variation in the extent to which economic activity has shifted from the state to the private sector.¹⁰

Available data suggest that Poland's competitive shock had a sudden, substantial effect on three key elements of the structure of Polish manufacturing industries: entry rates, concentration levels and the level of foreign presence. The Polish data on these elements of the structure of manufacturing sector will be described in a bit more detail in this section before being analyzed in the three sections that follow.

Data on the Structure of Polish Manufacturing

The data analyzed in this paper come from two statistical classification systems—the KGN and EKD systems. Poland used the KGN system through 1993. This was the system the country inherited from the communist era system with only a limited resemblance to the international standard industrial classifications (ISIC) used in most countries. As part of its program of reform, Poland switched to the EKD system of national accounts—which closely resembles the ISIC system—in 1993.

The data used to analyze changes in foreign presence (on industry sales, imports, and sales of foreign-owned plants) are available according to the old KGN classification system. These data are broken out by 14 'branches,' which roughly correspond to two-digit manufacturing industries. All data are collected at the two-digit level, permitting no further disaggregation. Appendix A provides a concordance between the KGN branches and two-digit SIC industries.

Data on net entry rates and concentration levels are available at the two-digit level in the newer EKD system—with manufacturing industries classified into 21 divisions. Appendix B provides a concordance between the two-digit EKD classifications and four-digit SIC

⁹ See Balcerowicz (1995) and Blaszczyk (1997).

¹⁰ See Kennedy (1997).

classifications. The data on net entry rates are calculated directly for each two-digit EKD division. The concentration data are reported at the two-digit level, but represent the arithmetic average of the six-largest-firm (C6) concentration levels for the three-digit industries within each two-digit division. For example, division 15, Food Products and Beverages, consists of nine groups: meat products, fish products, fruits and vegetables, cereals, dairy products, beverages, etc. GUS, the state statistical agency, reports the division 15 concentration ratio as the arithmetic average of the C6 level of the nine groups which the division comprises. Overall, a total of 102 three-digit 'groups' are aggregated into 21 two-digit EKD 'divisions' to calculate average concentration levels in Polish manufacturing.

The concordances in Appendices A and B permit the use, *inter alia*, of variables calculated on concordant sets of U.S. industries as instruments. The use of such instrumental variables is common, particularly in the study of emerging economies with deficient data. Our empirical analyses will shed some light on the extent to which the structural attributes of a stable, open market economy provide useful perspective on the structural opportunities in an economy that is just opening up as a result of a competitive shock.

A final attribute of the Polish data that deserves to be mentioned is that they cover two years: generally 1988 and 1993, although concentration data pertain to 1989 and 1993. It is fortunate that there is one year of data from before the competitive shock and one year of data from afterwards. But the presence of a competitive shock in between the two years is also problematic in a sense. In a mature economy, a five- or six-year data panel might provide powerful insights into equilibrium dynamics. In Poland, however, the occurrence of a competitive shock two years into the panel means that empirical patterns must be interpreted very carefully. We think that the Polish patterns provide insight into the dynamics of adjustment to a competitive shock rather than into comparative static shifts (due to a shock) in market equilibria. We will expand on the reasons why in the three empirical sections that follow.

This is also the most convenient place to define the variables used in the empirical sections, since a number of them will be used more than once. Table 2 provides definitions. The top half of the table lists variables that are used as dependent variables in the analysis, and the lower half of the table lists ones that are used as independent variables.

The independent variable used to control for initial concentration levels deserves special mention since it is used to calculate a summary measure of pre-shock distortions for each industrial sector. Unfortunately, only C6 data were available for Polish industries prior to reform, while C4 and C8 data are available for U.S. industries. The question of how to combine these two measures to produce a measure of distortion has important implications for the analysis. We have produced two measures, which generally yield very similar results. The first measure ($\Delta C6C4 = \text{Polish } C6 - \text{U.S. } C4$) simply measures the difference between the Polish and U.S. concentration measures. The second measure ($C6C4Ratio$) takes their ratio $\{ (\text{Polish } C6) / (\text{U.S. } C4) \}$. Neither measure clearly dominates the other, so results for both are reported.

Table #2
Variable Definitions:

| | | |
|------------------------|---|---|
| Dependent variables: | | |
| Polentry | = | $(\# \text{ firms}_{1993} - \# \text{ firms}_{1988}) / (\# \text{ firms}_{1988})$ — from GUS statistics. |
| ChangeC6 | = | change in a Polish industry's C6 ratio between 1989 and 1993 = $(C693 - C689)$ |
| FPxx | = | foreign presence = $(\text{SFOP} + \text{Imports}) / \text{industry sales}$ — SFOP stands for sales of foreign owned plants. xx indicates year. |
| DeltFP | = | change in foreign presence between 1988 and 1993 = $(FP93 - FP88)$ |
| FPWxx | = | foreign presence from the west = $(\text{SFOP} + \text{non-CMEA Imports}) / \text{industry output}$ |
| DeltFPW | = | change in non-CMEA foreign presence between 1988 and 1993 = $(FPW93 - FPW88)$ |
| Inv-Imp-Ratio1 | = | Investment to Import ratio — $(\text{SFOP}) / (\text{SFOP} + \text{non-CMEA Imports})$ — measures mix of total foreign presence in 1993. |
| Inv-Imp-Ratio2 | = | Investment to Import ratio — $(\text{SFOP}) / (\text{SFOP} + \text{change in non-CMEA Imports})$ — measures the mix of the <i>increase</i> in foreign presence between 1988 and 1993. |
| Independent variables: | | |
| NetUSEntry | = | $(\# \text{ firms}_{1992} - \# \text{ firms}_{1989}) / (\# \text{ firms}_{1989})$ — U.S. Commerce Dept. data |
| GrossUSentry | = | gross U.S. entry rate between 1989 and 1992 = $(\text{entrants} / \# \text{ firms } 1989)$ |
| USC4 | = | C4 concentration ratio averaged across comparable U.S. four-digit SIC industries, according to concordance in the data appendix. |
| DELTC6C4 | = | $(\text{Polish C6 level}_{1989} - \text{U.S. C4 level})$ |
| C6C4Ratio | = | $(\text{Polish C6}_{1989} / \text{U.S. C4})$ |
| Advert | = | advertising / sales — ratio is measured on U.S. 4-digit industries. Aggregated to the 2-digit level by averaging across concordant 4-digit industries. |
| Assets | = | book value fixed assets / sales — ratio is measured on U.S. 4-digit industries. Aggregated to the 2-digit level by averaging across concordant 4-digit industries. |
| RD | = | firm research and development costs / industry sales — ratio is measured on U.S. 4-digit industries. Aggregated to the 2-digit level by averaging across concordant 4-digit industries. |

2. Net Entry in Polish Manufacturing

Perhaps the most obvious change in industrial structure in Poland between 1988 and 1993 is the way in which the number of competitors increased in most industries. The number of competitors in the 21 2-digit manufacturing sectors went up by 40% in total. And the increase

was not confined to particular industry sectors: in 18 of the 21 2-digit sectors, the increase exceeded 20%. The only sector in which there was a significant net decrease was the "Miscellaneous" one.¹¹ So there was substantial net entry in Polish industry in the aftermath of that country's competitive shock.

What makes this observation interesting is the common presumption (even in work on developing countries—see Roberts and Tybout [1996], p. 192), that gross entry and exit rates are sufficiently highly correlated with each other so as to make net entry rates a poor indicator of overall turnover in an industry. We cannot directly examine this presumption in the present context because gross measures of entry and exit are (at present) unavailable for Polish manufacturing: only the measure of net entry is.¹² However, the measure of net entry in Polish manufacturing is so large in general (but also variable across 2-digit sectors) as to suggest that it is worth analyzing in its own right.

We start by modeling net entry in Poland as a function of the gross entry rate in the United States and two control variables that are rough proxies for structural conditions. The U.S. concentration ratio is used as an indicator of structural barriers to entry in a market economy and the difference between the Polish concentration level and the U.S. level (*DELTC6C4* or, separately *C6C4Ratio*) is used as a proxy for the pre-reform distortions in Polish industrial structure. The logic here is that pre-reform restrictions on entry in all sectors followed by partial reform might be expected to increase the equilibrium number of competitors the most in sectors characterized by low market-based barriers to entry (and exit) and, therefore, high gross entry rates (and exit rates). The results in table 3 indicate that by far the strongest relationship is the unexpectedly negative one between net rates of entry in Poland and gross rates of entry in the United States. The control measures both have the expected signs, although neither is

¹¹ "Miscellaneous" contains activities such as jewelry, musical instruments, and hard surface floor coverings. All statistical analysis was performed with and without this industry. None of the results changed substantially when these data were left out. Unless otherwise noted, statistical results are reported with data from "miscellaneous" industries included.

¹² Gross measures of entry and exit *are* available for the Polish economy as a whole. Polish data presented in Jackson *et al.* (1996) imply gross entry and exit rates of 34% and 21% respectively for 1991, roughly the middle of the period that we study. These rates are much higher than in the United States. In particular, the Polish gross entry rate for 1991 is comparable to the 5-year U.S. rates calculated by Dunne, Roberts and Samuelson (1988).

significant. High U.S. concentration lowers net Polish entry, and a large initial distortion (in Poland, generally very high initial concentration levels) is associated with higher net Polish entry. Column 1 reports results using the *DeltC6C4* measure of initial distortions. Column 2 reports results with the *C6C4Ratio* measures.

Table 3:
Net rates of Polish entry regressed on U.S. Entry Rates (plus controls)
(t-statistics)

| Regression | #1 | #2 | #3 | #4 |
|--------------------|----------------------|----------------------|-----------------------|-----------------------|
| Dependent Variable | Polentry | Polentry | Polentry | Polentry |
| Constant | 1.928 *** (2.68) | 1.637 * (1.92) | -0.037 (0.07) | -0.426 (0.59) |
| GrossUSEnter | -6.020 *** (2.62) | -5.943 *** (2.58) | | |
| NetUSEnter | | | -12.783 ** (2.43) | -10.802 ** (-2.12) |
| USC4 | -0.011 (-1.15) | -0.009 (0.82) | 0.00 (0.00) | 0.004 (0.36) |
| DeltC6C4 | 0.006 (1.05) | | 0.013 * (2.03) | |
| C6C4Ratio | | 0.187 (1.03) | | 0.350 (1.71) |
| R-squared | 0.32 | 0.32 | 0.30 | 0.26 |
| | * significant at 10% | ** significant at 5% | *** significant at 2% | |

We also model net Polish entry as a function of net entry in the United States (plus controls). Columns 3 and 4 of Table 3 suggest that the statistical significance of the negative relationship stays high, while the magnitude of the coefficient increases sharply (presumably because U.S. net entry rates are much lower than U.S. gross entry rates). The U.S. concentration ratio has no discernible influence, but the measures of pre-reform distortion (*DELTC6C4* and *C6C4Ratio*) are positive and marginally significant (at 6% and 11% respectively). This suggests that net entry in

Polish manufacturing between 1988 and 1993 reflected the transition from a policy regime in which the number of competitors was restricted below market-equilibrium levels to one in which entry was (at least partially) liberalized.

Clearly, the sectors that tend to be prone to high rates of entry, net or gross, in the United States are not the ones which attracted the most net entry in the aftermath of the Polish competitive shock: instead, the reverse was true. We interpret this pattern as suggesting that changes in the number of competitors in Polish manufacturing sectors were dominated, over the period studied, by the removal of prior restrictions on entry that had been applied *unevenly* across sectors. This explanation is supported by the effects of the *DELTC6C4* and *C6C4Ratio* variables, which provide rough proxies for the magnitude of pre-shock distortions. The limited statistical significance of the relationship between this proxy and the dependent variable studied in this section can be rationalized in terms of the noisiness of entry rates, gross and even net, as measures of structural change. Evidence from developed market economies, particularly the United States, indicates that even under equilibrium conditions, the process of entry is numerically dominated by what might be called “noise-entrants”: players who enter, turn out to be inefficient (often for reasons related to scale) and quickly exit.¹³ Disequilibrium conditions further complicate the conclusions that can be drawn from interindustry variations in entry rates. In particular, the fact that the most recent data for Polish manufacturing date back to 1993 leaves us only a four-year window to observe the (net) effects of post-shock entry and exit. The stylized facts about entry lags coupled with possibility of significant lags in exit suggest that four years may be too short a time-frame to allow many industries to run through full post-shock entry-exit cycles. For industries where this is a concern, measures of net entry can prove undesirably sensitive to whether they are measured three, four or five years after the onset of a competitive shock.

¹³ Dunne, Roberts and Samuelson (1988) find that, on average across four digit industries in the United States, 61.5% of all entrants exit in the five years following the first census in which they are observed. On average, 79.6% of all firms exit within ten years.

More recent Polish data will eventually become available. In the meantime, we desist from further exploratory analysis of entry rates and turn to a dependent variable that seems a more robust measure of structural change in the short-to-medium run in post-shock environments, changes in concentration levels.

3. Changes in Concentration in Polish Manufacturing

Changes in concentration levels seem to be a more robust measure of structural change in post-shock environments than do entry rates, for reasons that are both generic and circumstantial. Generically, a focus on changes in concentration levels rather than the level of net entry discounts noise-entrants. Circumstantially, the Polish data on concentration levels are reported at the two-digit level, like entry rates, but are actually collected at the three-digit level and then averaged. Such averaging affords more room for the law of large numbers to work out than 21 (unaveraged) observations might indicate: the precision of the estimates ought to improve substantially.

Theoretical predictions about whether increased competition should increase or decrease concentration levels are driven by whether one adopts an equilibrium or a disequilibrium (i.e., adjustment) perspective on post-shock environments. Sutton's ([1990], [1997]) models of the lowest feasible bounds on concentration, parameterized in terms of the intensity of price competition, provide the most robust set of predictions if one adopts the perspective that a competitive shock marks the transition from an equilibrium with relatively mild competition to an equilibrium with tougher competition. Specifically, Sutton relates the lowest bound on concentration in a particular market to the level of sunk costs that must be incurred (in stage 1) to compete in it, scaled by the size of the market, and to the toughness of price competition (in stage 2). One of his principal conclusions is that an increase in the toughness of price competition in a market increases the lowest level of concentration that is sustainable within it. This combination of a lower 'structural' bound plus parameterization in terms of the toughness of price competition suggests that from an equilibrium-to-equilibrium perspective, such shocks

may be expected to increase the observed levels of concentration (albeit with some noise, because Sutton's theoretical predictions provide only lower bounds).

Unfortunately for this line of reasoning, the concentration of local competitors decreased in most Polish manufacturing industries after that country's competitive shock. On average, the six-firm concentration ratio fell from 73% in 1989 to 61% in 1993. This compares to an average C4 and C8 of 40% and 53% respectively in the United States. Increases in average sectoral concentration were recorded in only two sectors, of which only one, publishing and printing, exhibited a substantial increase (from the lowest starting point in the sample).

These patterns map better into a somewhat different perspective on changes in concentration following a competitive shock: adjustment from an initial disequilibrium (in the sense of distortions of market forces) towards an equilibrium "target" level. Given the relatively high levels of concentration in pre-shock Polish manufacturing (documented earlier), an adjustment perspective would lead us to expect the target (post-shock) concentration levels to be lower than initial (pre-shock) concentration levels—as was indeed the case in Poland.

The adjustment perspective can take us one step farther: it can help explain interindustry variation in changes in concentration. The obvious way of specifying the dynamics of adjustment is to model the speed of adjustment toward the target level in terms of some measure of the gap between initial levels and target levels, i.e., the magnitude of pre-shock distortions. Once again, the DELTC6C4 variable (which compares Polish pre-shock concentration ratios and concordant U.S. counterparts, as described in Table #2), is the most obvious measure of pre-shock distortions.¹⁴ Column 1 of Table 4 suggests that DELTC6C4 packs much more power in explaining interindustry variations in changes in concentration than it did (in the previous section) in explaining changes in the number of competitors—presumably because of the particular noisiness (also alluded to in the previous section) of net entry rates in post-shock

¹⁴ All regression in Table 4 were run using the C6C4Ratio variable. This alternate specification did not change any of the estimates substantially.

environments. That last presumption is backstopped by the observation that adding in Polish net entry rates as an explanatory variable (column 2 of Table 4) fails to affect significantly the significance of DELTC6C4—or much else, including the significance of the additional variable itself.

Table 4
Change in Polish C6 Concentration Ratio
(t-statistics)

| Regression | #1 | #2 | #3 | #4 |
|--------------------|-----------------------|----------------------|-----------------------|-----------------------|
| Dependent Variable | ChangeC6 | ChangeC6 | ChangeC6 | ChangeC6 |
| Constant | -1.735 (0.213) | -2.089 (0.244) | -11.268 (1.237) | -15.559 ** (2.295) |
| DeltC6C4 | -0.321 *** (3.368) | -0.325 *** (3.25) | -0.255 *** (3.205) | -0.347 *** (5.478) |
| USC4 | -0.007 (0.039) | -0.003 (0.019) | -0.301 ** (2.271) | -0.321 *** (3.297) |
| Polentry | | 0.737 (0.199) | | |
| Advert | | | 4.852 *** (3.845) | 4.927 *** (5.324) |
| RD | | | 0.268 (0.159) | 2.047 (1.547) |
| Assets | | | 0.173 (1.128) | 0.245 ** (2.141) |
| R-squared | 0.39 | 0.39 | 0.76 | 0.87 |
| | * significant at 10% | ** significant at 5% | *** significant at 1% | |

Theory leads us to expect that changes in concentration will also be affected by structural attributes of the sector in question that are operationalizable in terms of the levels of different types of sunk costs: asset-intensity, advertising-intensity and R&D-intensity. Once again, it seems important to separate the impact of these variables on the sustainable lower bound on

concentration and their impact on the speed of adjustment from actual toward target levels. As far as the “bounds” approach is concerned, Sutton ([1990]; [1997]) shows that holding the toughness of price competition constant, the lowest possible level of concentration should be expected to increase with high levels of asset-intensity, advertising-intensity and R&D-intensity (with the effects of the last variable being predicated on limited technological heterogeneity across submarkets). In regard to the speed of adjustment toward target levels, these measures of sunk costs, calculated for concordant U.S. industries in a way that is supposed to capture the opportunities in equilibrium to invest in the corresponding assets, might be expected to act as barriers to entry or mobility that reduce the speed of adjustment toward target levels. We think that in light of the period studied in this paper as well as the results already reported herein that the lower bound effect will be captured in the ‘distance-from-equilibrium’ coefficient (on DELTC6C4) and are therefore inclined to interpret the three sunk-cost variables as measures pertinent to the speed of adjustment from disequilibrium to equilibrium.¹⁵

The results in columns 3 and 4 of Table 4 are consistent with the adjustment hypothesis. In column 3 (which contains results for all 21 branches) we see that all three of the coefficients on the sunkness variables are positive, indicating slower adjustment—with advertising intensity significant at the 1% level. While R&D-intensity and asset-intensity are not significant, adding the sunkness variables nearly doubles the overall R-squared, from 39% to 76%. Column 4 reports the results of excluding Branch 23 (Oil Refining, Coal Carbonization, and Nuclear Fuel), which experienced a very high rate of entry by small players into downstream activities (e.g., distribution) but in which the large upstream competitors remained state-controlled, resulting in a fairly small decline in concentration (9.6%). When we reestimate the model without this branch, which was an outlier in terms of the values of both pre-shock distortions (DELTC6C4 = 54.9%)

¹⁵ However, we should also note that because of pre-shock distortions that generally seemed to result in “excess” concentration and, consequently, post-shock decreases in concentration, the predictions associated with these two different perspectives are somewhat difficult to disentangle empirically. It seems useful, in any case, to report on the actual associations of the sunk cost measures with changes in concentration in Polish manufacturing.

and entry rates (Polentry = 284%), we see that the significance of all the coefficients increases, with the R-squared attaining a level of 87%.

In sum, attempts to explain changes in concentration levels seems to fare rather better than the earlier analysis of entry rates—in a way that supports the disequilibrium dynamics perspective on changes in industrial structure in the immediate aftermath of a competitive shock.

4. Changes in Foreign Presence

The final dimension of changes in the elements of industry structure that we explore in this paper pertains to foreign presence, measured in terms of imports and sales of foreign-owned subsidiaries. Competitive shock therapy programs often include the relaxation of constraints on foreign presence in the domestic economy. We therefore expect these programs to lead to a general increase in such foreign presence. (Of course, outbound flows, particularly exports, are likely to increase as well). Economic theory suggests, however, that this increase is unlikely to be uniform across sectors. Furthermore, the mix between imports and foreign direct investment will also vary systematically across industries. IO, building on international economics, helps generate specific predictions along two dimensions.

As far as variation in the level of foreign presence (broadly defined to include both imports and inbound FDI) across industries is concerned, the neoclassical theory of comparative advantage suggests that industries in which a reforming economy has a comparative disadvantage are the ones in which the largest increases in foreign presence (specifically imports) are to be expected. The modern theory of intra-industry trade adds the insight that many industries may not tip toward the extremes of exclusive domestic or foreign control because individual industries typically encompass many differentiated product varieties. This allows domestic firms to specialize in particular varieties while ceding others to foreign competition.

The IO-based theory of multinational corporations (MNCs) offers several additional insights. MNCs appear to exist to capitalize on productive assets that have flexible capacities but are subject to market imperfections. Such imperfections make licensing and other arm's-length transactions inferior methods for realizing those assets' values. In particular, intangible assets such as know-how and brand capital are thought to be difficult to contract on because of their information-impactedness *ex ante* and/or difficulties limiting their post-transaction use. A sizable body of evidence (summarized in Caves [1996]) suggests that R&D-intensity and advertising-intensity are especially robust, operationalizable industry-level predictors of the presence of MNCs. This suggests that, in the context of opening up by relatively poor countries that do not have a comparative advantage in stocks of intangible assets, we should expect to see particularly large increases in foreign presence in industries where R&D and advertising intensities are high.

The data from Poland seem entirely consistent with the hypothesis that foreign presence should increase in the domestic market in the aftermath of a competitive shock that involves external liberalization. Foreign presence (defined as imports plus sales of foreign-owned plants, scaled by industry domestic output) increased in all 14 KGN manufacturing branches. The average increase was 8.7% of industry output (rising from 10.2% to 18.9%). This increase, however, varied greatly across industries—ranging from 3.6% of output in the industrial machinery sector to 14.3% in the 'minerals' sector.

The obvious way to begin exploring interindustry variations in changes in foreign presence in Polish markets is by using (as in the previous section) U.S. data on advertising- and R&D-intensity as explanatory variables. Column 1 of Table 5 indicates that the results are somewhat puzzling. The general rise in foreign presence shows up in the constant term (significant at 0.6%), and the expected coefficient on advertising-intensity is marginally significant (5.8%), but the effect of R&D intensity is unexpectedly negative.

Once again, additional insight into these patterns is suggested by explicitly considering the nature of pre-shock distortions. In 1988, imports from CMEA countries were the largest component of foreign presence in Poland (on average, 5.4% of industry output), while non-CMEA imports were somewhat lower (4.8%) and sales of foreign-owned subsidiaries practically non-existent.¹⁶ Following reform, imports from CMEA countries fell sharply (to 2.2%), while imports from non-CMEA countries and sales of foreign-owned subsidiaries boomed (to 11.5% and 5.2%, respectively). These post-shock developments suggest that pre-shock distortions were very large. Column 2 of Table 5 indicates that high initial foreign presence was associated with R&D-intensity, but that advertising-intensity had little explanatory power. The fact that the CMEA trading bloc allocated heavy industries among member countries provides an explanation for the strong association between *RD* and foreign presence in 1988. The corresponding weakness in the association between *RD* and post-shock increases in foreign presence is therefore less surprising.

In order to further disentangle the effects of pre-shock distortions on sources of imports, we reconstructed the foreign presence variable to include only non-CMEA imports plus all sales of foreign subsidiaries. Such a redefinition is justified if we believe that CMEA imports had little to do with comparative advantage, and everything to do with politics. The new variable (FPW_{xx}) can be thought of as measuring the level of economically determined foreign presence. Column 3 of Table 5 contains results for this new specification, with much better results. Foreign presence, thus redefined, increases with both advertising- and R&D-intensity, and the significance levels, while not high, are reasonable given the small number of observations.

¹⁶ There was almost no cross-border investment among CMEA countries in the pre-shock era, and very little investment by non-CMEA countries.

Table 5
Changes in Foreign Presence
(t-statistics)

| Regression | #1 | #2 | #3 | #4 | #5 |
|--------------------|----------------------|----------------------|---------------------|-----------------------|-----------------------|
| Dependent Variable | DELTFP | FP88 | DELTFPW | Inv-Imp- Ratio1 | Inv-Imp- Ratio2 |
| Constant | 0.070 *** (3.540) | 0.082 *** (3.141) | 0.074 ** (2.589) | 0.231 *** (3.180) | 0.366 *** (4.451) |
| Advert | 1.686 * (2.114) | -1.666 (1.593) | 1.130 * (2.049) | 11.993 *** (4.108) | 12.839 *** (3.886) |
| RD | -0.666 (0.606) | 4.025 ** (2.793) | 2.680 ** (2.468) | -8.257 * (2.053) | -9.883 * (2.172) |
| R-squared | 0.33 | 0.52 | 0.43 | 0.69 | 0.67 |

* significant at 10%

** significant at 5%

*** significant at 1%

Finally, we consider whether foreign presence will occur via trade or FDI or, equivalently, whether production will be located overseas or locally. The balance between the two modes of participating in the domestic market reflects, in large part, differences in the costs associated with each: serving a market with imports involves transportation, local adaptation, regulatory and (residual) tariff-related costs; FDI, in contrast, forces a firm to fragment its operations and to adapt them to multiple currencies, commercial codes, customs and perhaps languages in ways that are likely to increase administrative expenses. The benefits delivered to buyers may also vary across these two modes of market participation: in a number of industries, local presence (through FDI) improves access to local demand for commercial reasons (e.g., shortened lead times) as well as regulatory ones.

We can summarize the balance between trade and FDI by calculating foreign-owned subsidiaries' sales scaled by these sales plus imports. For the sake of compactness, we will refer to this measure as the *investment-to-import ratio*. While we lack data on most of the determinants of the investment-to-import ratio cited above, we do have two serviceable proxies:

Advert and *RD*. Advertising-intensity is a proxy for localization costs and should therefore be positively associated with high investment-to-import ratios. R&D-intensity, in contrast, is expected to lead firms to centralize production and serve local markets through trade, leading to relatively low investment-to-import ratios.

Our data bear out these predictions. When the investment-to-import ratio is regressed on *Advert* and *RD* (columns 4 and 5 of Table 5), the signs on both coefficients are as expected and the significance levels are reasonable. The dependent variable in column 4 (*Inv-Imp-Ratio1*) measures the mix of total foreign participation in 1993. The model in column 5 focuses on changes between 1988 and 1993 (*Inv-Imp-Ratio2*). The coefficients of interest track each other closely in both models. The coefficients on the constant and *Advert* variables are all significant at 1%, while the *RD* variable is significant at 6.5% and 5.3% (respectively).

In summary, models which include all imports (specifically those distorted by CMEA trade arrangements) do not perform particularly well. On the other hand, if we focus our attention on interactions with non-CMEA countries, the changes in foreign presence correspond closely to the pattern suggested by theory. The increase in foreign presence is largest in those industries where intangible assets are important. This increase is tilted toward imports in R&D-intensive industries, and toward FDI (sales by foreign subsidiaries) in advertising intensive industries.

5. Conclusions

Competitive shocks in a variety of formerly socialist as well as nonsocialist countries provide an opportunity to study disequilibrium adjustment processes. Very little work has been done, however, on the effects of such competitive shocks on industry structure at the national (multi-industry level).¹⁷ In this paper, we make a start at such analysis by examining the effects of Poland's "big bang" on the structure of that country's manufacturing sector.

¹⁷ Kennedy (1997) is an exception: he uses cluster analysis to identify several generic patterns of industry transformation.

Our exploratory analysis is more successful at explaining the effects of Poland's competitive shock on changes in concentration and foreign presence than on entry rates. Taken together, our analyses of these elements of industry structure suggest that hypotheses that are sensitive to the specifics of initial structural distortions and lags in their adjustment fare significantly better as predictors of structural change in Polish manufacturing than do hypotheses that treat competitive shocks as having the comparative static effect of shifting observed elements of industry structure from one market equilibrium to a second, (parametrically) different one.

As more data become available, the use of longer time series and more narrowly defined industries will allow finer-grained analysis of post-shock environments. This affords a major research opportunity for students of industrial organization not only in Poland (where we, among others, are collecting such data) but also in a large number of other countries that have experienced economy-wide competitive shocks.

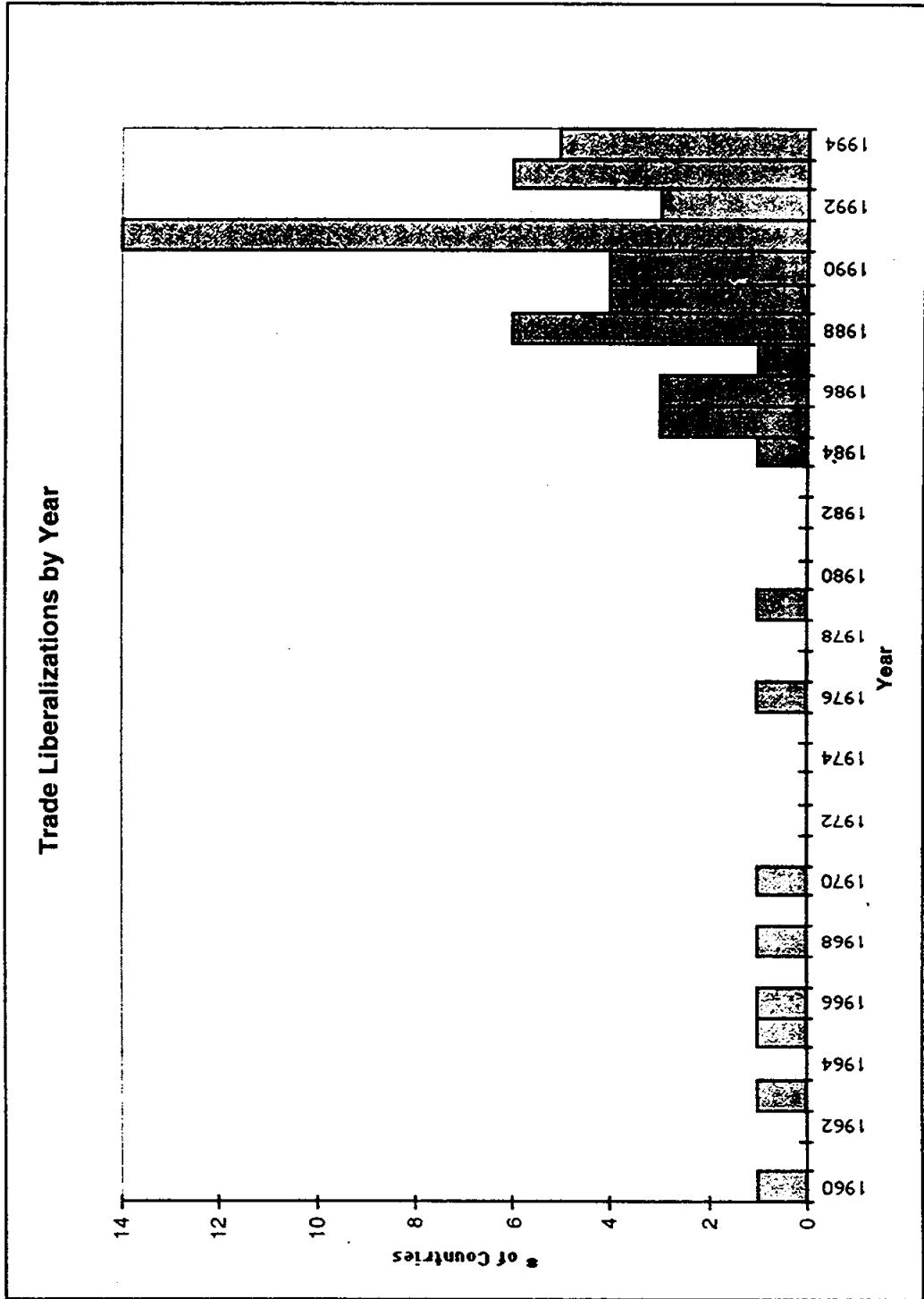
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Figure #1

Frequency of Trade Liberalizations by Year



**Data Appendix A:
Concordance Between Polish KGN Classifications and SIC Codes**

Foreign Presence Analysis:

Data on imports and foreign direct investment are available in the KGN classification system for all manufacturing industries. This system provides 14 Polish sectors. These Polish sectors were matched to two-digit SIC groupings as follows:

| <u>Polish Sector</u> | <u>U.S. SIC Codes</u> |
|----------------------|--|
| Food | 20 Food and Kindred Products 21 Tobacco Products |
| Light Manufacturing | 22 Textile Mill Products 23 Apparel and Other Textile Products 25 Furniture and Fixtures |
| Wood Products | 24 Lumber and Wood Products |
| Paper Products | 26 Paper and Allied Products |
| Printing | 27 Printing and Publishing |
| Chemicals | 28 Chemicals and Allied Products 30 Rubber and Misc. Plastics Products |
| Fuel and Power | 29 Petroleum and Coal Products |
| Misc. | 31 Leather and Leather Products 39 Misc. Manufacturing Industries |
| Mineral | 32. Stone, Clay, and Glass Products |
| Metallurgical | 33 Primary Metal Industries |
| Metal Products | 34 Fabricated Metal Products |
| Industrial Machinery | 35 Industrial Machinery and Equipment |
| Electro Engineering | 36 Electronic & Other Electric Equipment 38 Instruments and Related Products |
| Transport | 37 Transportation Equipment |

Data Appendix B:
Concordance Between Polish EKD Classifications and SIC Codes

Concentration and Entry Analyses:

Data on both concentration and entry are available in the EKD classification system for 1988 and 1993. The EKD system contains 21 industrial divisions. The concordance with two-digit SIC classifications is fairly high, although not precise. The concordance with four-digit SIC codes is as follows:

| Polish Division | SIC Codes |
|---|-----------------------|
| D 15: Food and Beverages | 2011-2099 |
| D 16: Tobacco | 2111-2141 |
| D 17: Textiles | 2211-2399 |
| D19: Leather and Leather goods | 3111-3199 |
| D 20: Wood and wood products | 2411-2499 |
| D 21: Paper and cellulose | 2611-2679 |
| D 22: Publishing and printing | 2711-2796 |
| D23: Oil refining, Coal carbonization, and Nuclear fuel | 2911-2999 |
| D 24: Chemicals, artificial fibers | 2812-2899 |
| D 25: Rubber and Plastic products | 3011-3089 |
| D 26: Nonmetallic products | 3211-3299 |
| D 27: Metals | 3312-3399 |
| D 28: Ready-made metal products except machinery and equipment | 3411-3499 |
| D 29: Machines and equipment | 3511-3569 |
| D 30: Office equipment and Computers | 3571-3599; 3621-3648 |
| D 32: Radio, comm. and television equip. | 3612; 3613; 3651-3699 |
| D 33: Medical, precise and optical inst., clocks and watches | 3812-3873 |
| D 34: Motor vehicles and trailers | 3711-3716 |
| D 35: Other transportation equipment | 3721-3799 |
| D 36: Furniture | 2511-2599 |
| D 38: Misc. | 3911-3999 |