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Competitive shocks and industrial structure: the case of Polish manufacturing

Pankaj Ghemawat*, Robert E. Kennedy

Graduate School of Business Administration, Harvard University, Soldiers Field, Boston, MA 02163, USA

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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.

Keywords: Eastern Europe; Poland; Transition; Industry Structure

JEL classification: L16; L6; O12

1. Introduction

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*

*Corresponding author. Tel.: + 1-617-4956270; fax: + 1-617-4950355.
E-mail address: pghemawat@hbs.edu (P. Ghemawat)

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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).

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 (Sachs and Warner, 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 2 provides background information on and a brief description of Poland's competitive shock. Sections 3 through 5 analyze, respectively, changes in entry rates, concentration levels and foreign presence in Polish manufacturing. Section 6 concludes with suggestions for further research on the microeconomic effects of competitive shocks.

2. 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 the data available (so far) on the structure of Polish manufacturing. Much more

elaborate treatments of the first two topics are available from a number of other sources.[1]

2.1. 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.

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

[1] For the condition of the pre-shock economy, see for example: Lipton and Sachs (1990); Berg and Sachs (1992); Sachs (1993); Balcerowicz (1993a), (1993b); Blanchard et al. (1994). The data on pre-shock conditions is from GUS (Glowny Urzad 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] 67C:\INDOR\1125\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).

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]

2.2. 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 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;

[5] See for example, Pinto et al. (1992); Olson (1992); Krueger (1992).
[6] Balcerowicz (1994).
[7] Ibid., p. 161.

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 was 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 has proceeded slowly and, through the first 5 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.

2.3. 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, and it has only a

[8] The official rate per U.S. dollar fell from 1,340 zloty to 9,500 zloty between September 1989 and January 1990.

[9] See Balcerowicz (1995); Blaszczyk (1997).

[10] See Kennedy (1997).

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 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 make up the division. 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 Appendix A and Appendix 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 2 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

Table 2
Variable definitions

Dependent variables:		
Polentry	=	$(\#\ \text{firms}_{1993} - \#\ \text{firms}_{1988})/(\#\ \text{firms}_{1988})$. From GUS statistical office.
ChangeC6	=	Change in Polish industry's C6 ratio between 1989 and 1993 = (PolC693 − PolC689)
PolC6xx	=	C6 concentration ratio for a Polish industry in 19xx. From GUS statistical office.
FPxx	=	Foreign presence = (SFOP + Imports)/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 in 19xx.
	=	(SFOP + non-CMEA Imports)/industry output
DeltFPW	=	Change in non-CMEA foreign presence between 1988 and 1993.
	=	(FPW93 − FPW88)
Inv-Imp-Ratio1	=	Investment to Import ratio. Measures mix of total foreign presence in 1993.
	=	(SFOP)/(SFOP + non-CMEA Imports).
Inv-Imp-Ratio2	=	Investment to Import ratio. Measures the mix of the increase in foreign presence between 1988 and 1993.
	=	(SFOP)/(SFOP + change in non-CMEA Imports)-
Independent variables:		
GrossUSentry	=	Gross U.S. entry rate between 1989 and 1992. U.S. Commerce Dept. data.
	=	(entrants/# firms 1989)
NetUSEntry	=	$(\#\ \text{firms}_{1992} - \#\ \text{firms}_{1989})/(\#\ \text{firms}_{1989})$.
USC4	=	C4 concentration ratio averaged across comparable U.S. four-digit SIC industries, according to concordance in the data appendix. Data is from the 1992 Census of Manufacturers. Data from the 1992 Census of Manufacturers.
C6C4Ratio	=	(Polish $C6_{1989}$/USC4)
Advert	=	Advertising/sales. Ratio is measured on U.S. four-digit industries. Four-digit measures are aggregated to the two-digit level by taking the U.S. sales-weighted average across concordant four-digit industries. Data are from the FTC Line of Business Report (Federal Trade Commission and Bureau of Economics, 1985), and reflect responses to the 1977 survey.
Assets	=	Book value fixed assets/sales. See ''Advert'' for source and aggregation methodology.
RD	=	Firm research and development costs/industry sales. See ''Advert'' for source and aggregation methodology.

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. We use the ratio of the two measures (C6C4Ratio = PolC689/USC4) to measure the magnitude of pre-shock distortions. A second possibility is to difference the two measures (PolC689 − USC4), but this measure has a linear relationship to USC4, which is used as a separate control variable.[11]

3. 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 two-digit manufacturing sectors went up by 40% in total. And the increase was not confined to particular industry sectors: in 18 of the 21 two-digit sectors, the increase exceeded 20%. The only sector in which there was a significant net decrease was the ''Miscellaneous'' one.[12] 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.[13] However, the measure of net entry in Polish manufacturing is so large in general (but also variable across two-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

[11] The results for specification that use the (PolC689 − USC4) variable are quite similar to those with the C6C4ratio measure. We report results with the latter measure because it simplifies interpretation of the coefficient estimates.

[12] 'Miscellaneous' contains activities such as jewelry, musical instruments, and hard surface floor coverings. All statistical analyses were 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.

[13] 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.

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 ratio between the Polish concentration level and the U.S. level (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 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 of this simple specification. A referee suggested including PolC689 and 1/(USC4) as additional control variables and eliminating USC4. The results reported in column 2 indicate that these controls have little effect on the coefficients of interest.[14]

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

Regression Dependent variable	#1 Polentry	#2 Polentry	#3 Polentry	#4 Polentry
Constant	1.637*	2.871	− 0.426	0.332
	(1.92)	(1.26)	(0.59)	(0.13)
GrossUSEntry	− 5.943***	− 5.663***		
	(2.58)	(2.44)		
NetUSEntry			− 10.802**	− 11.524**
			(−2.12)	(−2.04)
USC4	− 0.009		0.004	
	(0.82)		(0.36)	
C6C4Ratio	0.187	0.996	0.350*	0.518
	(1.03)	(1.06)	(1.71)	(0.51)
PolC689		− 0.023		− 0.003
		(0.86)		(0.11)
InvUSC4		− 56.86		− 26.11
		(0.72)		(0.31)
R^2	0.32	0.34	0.26	0.28

*, significant at 10%; **, significant at 5%; ***, significant at 2%.

[14] We also ran specifications using the U.S. gross exit rate and Polish industry average return on sales as control variables. Neither of these variables was significant, and the coefficients on the key variables of interest were little changed.

We also model net Polish entry as a function of net entry in the United States (plus controls).[15] Columns three and four 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 coefficients on the measure of pre-reform distortion (C6C4Ratio) are positive and (in one case) marginally significant. 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 are 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. While there are a number of possible explanations for this pattern, it is suggestive that the average net entry rate in Poland (measured across industries) was 46.7%, while the net entry rate in the United States was only 0.8%. We incline, therefore, toward the interpretation 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 effect of the C6C4Ratio variable, which provides a rough proxy 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.[16] 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 4 year window to observe the (net) effects of post-shock entry and exit. The stylized facts about entry lags coupled with the possibility of significant lags in exit suggest that 4 years may be too short a time-frame to allow many industries to run through full post-shock entry–exit cycles. For industries

[15] The U.S. data reflect (near) equilibrium dynamics, while we believe the Polish data reflect a disequilibrium adjustment process. Thus, there is no theoretical linkage between the two measures. Given the somewhat puzzling results in columns one and two, however, we believe it is worthwhile to explore the entry relationship between similarly defined variables, even if they measure different underlying environments.

[16] Dunne et al. (1988) find that, on average across four digit industries in the United States, 61.5% of all entrants exit in the 5 years following the first census in which they are observed. On average, 79.6% of all firms exit within 10 years.

where this is a concern, measures of net entry can prove undesirably sensitive to whether they are measured 3, 4 or 5 years after the onset of a competitive shock.

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.

4. 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 (Sutton (1991), (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).

The pattern of changes in concentration does not, however, support a comparative statics approach. 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 C6C4ratio 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. Column 1 of Table 4 suggests that C6C4ratio packs much more power in explaining interindustry variation 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 environments. That last presumption is backstopped by the observation that adding in Polish net entry rates as an explanatory variable

Table 4
Change in Polish C6 concentration ratio (*t*-statistics)

Regression Dependent Variable	#1 ChangeC6	#2 ChangeC6	#3 PolC693	#4 PolC693
Constant	− 12.032	− 11.907	− 1.735	− 11.268
	(1.02)	(0.99)	(0.21)	(1.24)
C6C4ratio	− 9.963***	− 10.10***		
	(2.98)	(2.87)		
USC4	− 0.141	− 0.140	0.314*	− 0.046
	(0.76)	(0.73)	(1.75)	(0.32)
Polentry		− 0.703		
		(0.199)		
PolC689			0.679***	0.745***
			(7.13)	(9.37)
Advert				4.852***
				(3.845)
RD				0.268
				(0.159)
Assets				0.173
				(1.128)
R^2	0.39	0.39	0.81	0.92

*, significant at 10%; **, significant at 5%; ***, significant at 1%.

(column two of Table 4) fails to affect significantly the significance of C6C4ratio, or much else, including the significance of the additional variable itself.

An alternate approach models the concentration level in 1993 in terms of the initial concentration level (PolC689) and a target level (USC4).[17] The results reported in column three indicate that the magnitude of the pre-shock distortion influences the speed of adjustment.

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 (1991), (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.[18] 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 C6C4ratio) and are therefore inclined to interpret the three sunk-cost variables as measures pertinent to the speed of adjustment from disequilibrium to equilibrium.[19]

The results in column four of Table 4 are consistent with the adjustment hypothesis. We see that all three of the coefficients on the sunkenness 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 sunkenness variables increases the overall R^2, from 81% to 92%.

[17] The ChangeC6 variable in columns one and two has a non-linear relationship to the C6C4 Ratio measure. The specifications in columns three and four avoid this issue.

[18] A referee pointed out that a specification that interacted Advert, RD, and Assets with the concentration level in 1989 would be preferable, as it would allow the speed of adjustment to vary across industries. However, given the nature of our sample, we refrain from reporting a specification with three non-linear variables.

[19] 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 nevertheless seems useful to report on the actual associations of the sunk cost measures with changes in concentration in Polish manufacturing.

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.

5. 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 one 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.[20] 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 two 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

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***	0.082***	0.074**	0.231***	0.366***
	(3.540)	(3.141)	(2.589)	(3.180)	(4.451)
Advert	1.686*	− 1.666	1.130*	11.993***	12.839***
	(2.114)	(1.593)	(2.049)	(4.108)	(3.886)
RD	− 0.666	4.025**	2.680**	− 8.257*	− 9.883*
	(0.606)	(2.793)	(2.468)	(2.053)	(2.172)
R^2	0.33	0.52	0.43	0.69	0.67

*, significant at 10%; **, significant at 5%; ***, significant at 1%.

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

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 (FPWxx) can be thought of as measuring the level of economically determined foreign presence. Column three 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.

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–import ratio. While we lack data on most of the determinants of the investment–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–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–import ratios.

Our data bear out these predictions. When the investment–import ratio is regressed on Advert and RD (columns four and five of Table 5), the signs on both coefficients are as expected and the significance levels are reasonable. The dependent variable in column four (Inv-Imp-Ratio1) measures the mix of total foreign participation in 1993. The model in column five 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.

6. 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).[21] 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.

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

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:

Polish Sector	U.S. SIC Codes
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 and other electric equipment
	38 Instruments and related products
Transport	37 Transportation equipment

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
D 19:	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

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