The Political Economy of Currency Boards: Case of Bosnia and Herzegovina

Shirley J. Gedeon*

Abstract:

Currency Board Arrangements (CBAs) operate in several post-socialist European economies as an alternative to traditional central banking. The CBA literature primarily focuses on the discipline of the fixed exchange rate, suggesting that the gain of reduced exchange rate volatility and monetary stability outweigh the loss of independent monetary policy. It does not address the role and impact of foreign ownership of the banking system on currency board dynamics. Through a case study of the CBA in Bosnia and Herzegovina over a ten-year period, including the global financial crisis of 2008-09, this paper suggests that monetary policy is not abandoned; it is decentralized and privatized and critical to the maintenance of financial stability of the CBA.

Keywords: Currency Board; transition economies; Bosnia and Herzegovina; monetary policy; southeast Europe

JEL: E5, G1, G2, P2, P3

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1. Introduction

A currency board is an alternative to the traditional central bank. Under a currency board arrangement (CBA), monetary authorities explicitly commit to exchange domestic currency for a specified foreign currency at a fixed exchange rate. Currency boards have been in existence for more than 150 years, but primarily in small, British colonial territories. (Schwartz 1993) Recently currency boards have been installed in Lithuania (1994), Estonia (1992), Bulgaria (1997), and Bosnia and Herzegovina (1998) under the guidance of the International Monetary Fund with the hope of addressing the legacy of soft budget constraints, over-issue of money notes by the post-socialist governments, and the time-consistency problem. (Wolf, et. al. 2008)

Unlike the traditional central bank, a currency board is unable to directly control its own assets. It may neither purchase assets from commercial banks via the discount window nor engage in open market operations; hence, the monetary base is beyond its control. *It passively waits for requests from banks to sell foreign exchange for domestic currency.* The literature primarily focuses on the discipline of the fixed exchange rate, viewing the currency board as a "super-fixed" exchange rate system. The tradeoff is one of reducing exchange rate volatility and promoting monetary stability versus implementation of discretionary monetary policy.

While lip service is paid in the literature to the *sources* of the foreign exchange that is exchanged for domestic currency, namely net exports, remittances, and foreign capital inflow, there has been little analysis of how the ownership structure of the domestic banking system impacts the flow of foreign exchange reserves and affects monetary stability. Through a case study of the currency board regime in Bosnia and Herzegovina over a ten year period, including the global financial crisis of 2008-09, we will see that foreign bank loans disbursed through local subsidiaries have been the main source of credit growth, imposing serious risks to financial stability and necessitating emergency monetary policy-like initiatives

Shirley J. Gedeon Department of Economics University of Vermont e-mail: Shirley.gedeon@uvm.edu in order to maintain the convertibility of the currency. While the literature may suggest that monetary policy is deactivated and unnecessary under a currency board regime, we will argue that this is not the case. This paper suggests that the monetary policy is decentralized and privatized and critical to the maintenance of financial stability under the currency board arrangement.

2. Theory and Operation of the Currency Board

The primary difference between a currency board and traditional central bank centers on what may be held as assets against the monetary base. Traditional central banks may hold foreign as well as domestic assets, i.e., government debt and commercial paper, against domestic currency and the reserve deposits of commercial banks. A currency board, however, may only hold foreign currency assets against its liabilities of base money (domestic currency and bank reserves).

The prohibition against holding domestic assets has implications concerning the ability of a currency board to carry out monetary policy. While a traditional central bank may pursue discretionary monetary policy by altering its portfolio of domestic assets to change the monetary base or support the exchange rate, the monetary authority under a CBA may neither purchase assets from commercial banks via the discount window nor engage in open market operations; hence, the monetary base is beyond its control. A purchase of foreign exchange (FX) is recorded on the asset side of the balance sheet of the currency board as an increase in FX assets and simultaneously on the liability side as an increase in domestic-currency denominated reserves in the banking system. Under the rule-based CBA, market forces determine the monetary base; it is increased when the private sector commercial banks sell foreign currency to it at the fixed exchange rate and is decreased when commercial banks purchase foreign currency from it, for example, to finance a balance of payments deficit. (Williamson 1995; Berensmann 2004) The only traditional monetary policy tool available to a central bank operating a currency board is the reserve requirement.

Figure 1 illustrates the relationship of foreign currency reserves and the monetary base for the CBA in Bosnia and Herzegovina where the anchor currency is the euro and the domestic currency the Bosnian convertible mark, BAM (locally abbreviated in the Latin and Cyrillic alphabets as KM). The exchange rate is set at 1 euro = 1.95 BAM. The chart is composed of two tables and shows that the

monetary base varies under the influence of KM sale and purchase transactions conducted by commercial banks and the currency board. Table 1 shows the monthly sale of KM (purchase of euro) and purchase of KM (sale of euro) with the currency board. The annual balance of sales and purchases explains the cumulative change of foreign exchange that the board holds. For example, at the end of 2008, the net outflow of euro totaling KM 631.1 million explains the source of the decrease in the cumulative balance from KM 5,936 million in 2007 to KM 5,304.9 million in 2008. The buy/sell cumulative balance explains the change in the total amount of foreign assets held by the currency board as well as the decrease in the total amount of foreign assets held by the currency board to KM 6,323.6 million.¹ Table 2 shows that at the end of 2008 the monetary base--reserves (R) and currency in circulation (C)--totaled KM 5,704 million and was covered by the foreign assets of KM 6,323.6 million at the end of December 2008.

Currency boards function within a fractional reserve banking system. Commercial banks accept both foreign currency and domestic currency denominated accounts. The liabilities of commercial banks are not covered by currency board assets; therefore, they must self ensure that they have sufficient reserves and other liquid assets to meet depositor demands for either domestic currency or euro. Monetary authorities typically spell out liquidity asset requirements on deposits in addition to traditional reserve requirements to safeguard against foreign exchange and liquidity risk.

2.1. Currency Board, Money Supply Endogeneity and the Classical School

The CBA is rooted in the classical paradigm. The mechanisms assumed to maintain financial equilibrium and restore full employment and the balance of payments occur through the adjustment of national price levels and the free flow of specie. Money supply endogeneity is traced through Δ international reserves \rightarrow Δ monetary base $\rightarrow \Delta$ broad money. The metaphor most often cited to explain the simplicity and rule-bound nature of the CBA borrows from the price/specie flow mechanism of Hume's gold standard. (See Williamson 1995; Hanke and Schuler 1991; Kopcke 1999; Desquilbet and Nenovsky 2004; Wolf et. al. 2008) In these accounts, a current account deficit will lead to a reduction in the monetary base as the public trades domestic currency for foreign currency. This will cause a rise in interest rates,

fall in aggregate demand, and depreciation of the real exchange rate that set into motion a restoration of equilibrium. The contraction in the money supply also reduces demand for labor and other factors of production, reducing the country's prices relative to other countries.² A variant of this analysis uses the insight of the fixed exchange rate version of the Mundell-Fleming model, where under a super-fixed rate regime it is impossible to simultaneously have independent monetary policy, open capital markets, and a fixed exchange rate—the so-called "Impossibility of the Holy Trinity." (Wolf *et. al.* 2008; Dornbusch and Giavazzi 1999)

The apparent attractiveness of the currency board lies

in its rigidity: by fixing the nominal exchange rate, tying the hands of the monetary authorities from monetizing state debt, and guaranteeing convertibility of the domestic currency into foreign exchange, it addresses the time-consistency problem and invites confidence—for the domestic public as well as foreign investors. (Wolf *et. al.*).

While much of this literature suggests that the issue of money under a currency board regime expands and contracts in line with the surplus or deficit on the current account (i.e., the balance of trade), this is technically incorrect. It is the balance of payments, including the transfer of workers' remittances and net private capital

						KM millions
Year	Selling KM	Buying KM	Balance	Cum Ba	ulative lance	Foreign Assets CBBH
2003	2,026.5	1,751.7	274.8	2,3	398.1	2,820.7
2004	4,295.9	3,648.6	647.3	3,0	045.4	3,506.8
2005	3,324.4	2,623.4	701.0	3,7	746.4	4,252.3
2006	3,316.1	2,181.7	1,134.3	4,8	380.8	5,479.5
2007	3,878.1	2,822.8	1,055.2	5,9	936.0	6,726.3
2008	4,933.2	5,564.3	-631.1	5,3	304.9	6,323.6
2009	4197.6	4,234.4	-36.849	5,2	268.1	6,239.9
Source: CBBH Bulletin 2009b Table 1: Central Bank of Bosnia and Herzegovina (CBBH) Buying and Selling of KM					KM millions	
	ASSETS			LIAE	BILITIES	
2	2007 2008 2	2009		2007	2008	2009
FOREIGN ASSETS	6,726.3 6,323.6	6,239.9	CURRENCY OUTSIDI MONETARY AUTHORITIES, C	E 2,439.7	2,552.4	2,267.7
			BANK RESERVES, R	3,789.3	3,151.6	3,381.2
PRIV. SECTOR	2.2 2.0	1.9	FOREIGN LIABILITIES	.9	1.0	.9
			CENTRAL GOVT DEPOSITS	74.8	23.4	413.2
			CAPITAL ACCTS	387.3	499.3	552.3
			OTHER	36.4	97.9	-22.3
TOTAL 6,728.4	TOTAL	6,728.4	6,325.6	6,464.2		

Figure 1

Source: CBBH Bulletin, 2009b

Table 2: Balance Sheet of the Central Bank of Bosnia and Herzegovina, 2007 – 09

inflow, that determines changes in gross foreign exchange reserves and hence the domestic monetary base. It is critical to bear this in mind: the money supply in each of the four European economies operating under a CBA has moved has moved *in the direction opposite* to the balance of trade—contrary to what the literature would predict—suggesting a different source of money supply endogeneity than the current-account-adjustment parable touted in the CBA literature. (For more on this point see Poirot 2003; Gedeon and Djonlagic 2009; Ponsot, 2006; Brixiova, Vartia, Worgotter 2009)

2.2. Shortfalls of the Currency Board Arrangement

Ironically the shortfalls of the CBA stem from its main strength—its rigidity. Skepticism about the stability properties of a CBA can be placed into three categories: (1) concern about price and wage flexibility that would be required—in the absence of nominal exchange rate changes—to correct for disequilibrium; (2) absence of lender of last resort; and (3) concern about the impact of capital inflows and external debt on monetary stability.

Price/wage flexibility and economic adjustment. The fundamental pro-CBA argument is that under super-fixed exchange rate regimes, any kind of shock must be absorbed through price and wage adjustments and not through monetary policy. Skeptics raise the issue that relative price changes are often difficult to engineer and point to labor market rigidities, institutional and legal/political obstacles to bankruptcy and property transfer, and to extreme structural unemployment. To the extent that factor markets do not adjust quickly, negative shocks will be amplified. This can lead to financial turmoil, economic slowdown, and higher unemployment. (Poirot 2003; Edwards 2003; Silajdzic 2005; Chang and Velasco 1999)

Absence of lender of last resort. There is no designated lender of last resort under a currency board system. The standard argument is that the CBA can induce extremely rigorous macroeconomic discipline by prohibiting lending of last resort to both government and banks. In their defense of the self-regulating properties of a CBA, Balino et. al. (1997) explain that the absence of a lender of last resort promotes market discipline, limits moral hazard and induces banks to lower their exposure. It is assumed that domestic banks (or their parent banks) will lend reserves to each other through an inter-bank (federal funds) market, screening out those they deem insolvent. Hence, adverse selection is not seen as an obstacle since banks are assumed to be well placed to evaluate peer banks' financial situations.

Dornbusch and Giavazzi (1999) mention that currency boards could require banks to secure agreement from foreign financial institutions that they be provided with lender of last resort services, privatizing lender of last resort and regulatory services. But they do not address the issue of how parent banks would cope with subsidiary distress when the parent bank itself faces liquidity challenges. However, Humphrey (1989) Freixas et. al. (2002) and Joksas (2004) discuss a variety of reasons why the inter-bank market may not be a reliable substitute for the central bank: (1) information asymmetry may cause banks to hesitate to lend to another bank. An otherwise sound bank that for whatever reason is refused credit can become unsound, and this can exacerbate a financial crisis; (2) the inter-bank market may become more cautious in times of crisis and may withhold excess reserves from the market when they are most needed; and (3) a liquid bank may decide to risk lending to a few banks in trouble, but not all. It may be unwilling to "diversify its portfolio" in the same way that a central bank would. (Humphrey 1989; Freixas, Hoggarth, Soussa 2002; Joksas 2004)

Without a designated lender of last resort with unlimited international resources, a loss of depositor confidence can trigger a deposit run, forcing the currency board to sell foreign exchange, thereby contracting the monetary base. This can increase the risk of creating a deeper and more prolonged recession. It is also possible during a financial crisis that foreign banks may determine that it is not in their private interest to remain exposed and invested in the CBA country or region as a whole. Uncertainty about other banks' commitments to support subsidiaries may tempt risk-adverse agents to cut back on lending or abandon the region, causing a withdrawal of foreign exchange and investment capital. (Winkler 2009)

Impact of capital inflows and external debt on monetary stability. One of the fundamental propositions of the CBA is that free capital mobility coupled with fixed exchange rates promotes lower domestic inflation and higher growth potential. (Hanke and Schuler 1991; Ghosh, Gulde, Wolf 1998; Wolf *et. al.* 2008; Williamson 1995) Lower interest rates in the developed industrial world drive investors to seek higher yields in emerging markets, and both investor and recipient are assumed better off. For the investor, capital flows diversify risks and maximize profits. For the recipient, foreign capital can finance investment and stimulate economic growth, thereby improving trade capabilities and creating the resources to support external debt.

However, this discussion assumes that the foreign capital primarily flows into manufacturing and the real production sectors where it provides for the development of an export sector. It ignores the growing importance, motivation and effects of financial sector foreign direct investment, namely, the establishment of branches and subsidiaries of banks from the industrialized economies. Recently a number of economists have examined the impact of parent bank financial capital flows to subsidiaries in emerging markets in economies of southeast Europe (SEE).⁴ (Ostry et. al. 2010; Winkler 2009; Sorsa et. al. 2007; Zettelmeyer 2009; Arvai, Driessen, and Otker-Robe 2009; Aydin 2008; Mihaljek, 2006a. 2006b; Kraft and Jankov 2005; Aristovnik 2007; Backé and Walko 2006) This literature challenges some of the conclusions of the free capital mobility argument, pointing to the negative consequences of unregulated open capital markets. These include lending booms fueled by credit drawn on parent banks, widening current account deficits, inflation pressures, and susceptibility to credit shocks.

The insight of this literature contributes to understanding further the shortfalls of the currency board argument. They can be summarized under three topics: (1) speed of entry of capital; (2) stop or reversal of capital flow; and (3) external indebtedness.

Speed of Entry and Investor Myopia: In the past 10 years foreign liabilities provided to subsidiaries by parent bank groups have fueled extraordinary growth in domestic credit and the broad money supply in SEE economies, averaging annual increases in loans of 27%. (Backe and Walko 2006; Mihaljek 2006a) The speed itself appears associated with a kind of herd behavior that fuels excessive optimism on the part of foreign lenders that induce responses to changes in risk. Perhaps because of difficulties in measuring the time dimension of risk, it drives subsidiaries to establish and expand market presence, but it can also strain the capacity of banks to properly evaluate credit applications and monitor exposure, raising credit risks. Evidence suggests that rapid credit growth generates large exposures by the household and corporate sector to banks, real estate and other asset bubbles, widens current account deficits and increases inflationary pressure. (Ostry et. al. 2010; Aydin 2008)

The problem is compounded in countries with a CBA because there are virtually no tools available to mop up

excess liquidity. In order to constrain money supply growth, the central bank can use the required reserve ratio and impose stiffer liquidity requirements on banks, but in none of the European countries governed by CBAs has this tool been effective. (Minea and Rault 2008; Causevic 2009; Niksic 2009; Brixiova, Vartia, Worgotter 2009)

Stops and Vulnerability: The loss of access to international capital markets can create a swift and drastic reversal of capital flows if depositors and banks move funds out of the domestic banking system. The loss of international reserves—due in many cases to a change in conditions in parent home countries that make lending more difficult or less profitable—especially affect countries under a CBA because it immediately reduces the monetary base and with it the money supply, creating a whiplash effect. (Arvai 2009)

External indebtedness. Capital inflows can fund any kind of domestic activity, and among the SEE countries, most financial sector FDI has been directed to investment in trade and real estate rather than manufacturing. This raises the external debt-to-GDP ratios but does not necessarily improve export competitiveness, upon which rests the means to service the debt. ⁵

3. Macroeconomic Performance in BiH under the Currency Board Regime: 2000-2009

As mentioned above, CBA literature contends that the domestic money supply adjusts endogenously to changes in the balance of payments, mimicking the selfregulatory mechanism of the gold standard. A trade deficit should trigger reserve losses, and the automatic link between reserve losses and tightening of domestic credit is the "poison pill" that is said will harden budget constraints, maintain transparency and confidence, and render monetary policy dispensable. Using Bosnia and Herzegovina as a case study, we focus on the coincidence of long-term balance of payments deficits and expansionary credit growth from 2002-2008 and the whiplash effect arising from the global financial crisis in 2008. We agree that money supply growth under this CBA has endogenous sources, but they appear to be linked to the needs of foreign bank groups and not the outcome of domestic economic activity.

From 2000 to 2008, Bosnia and Herzegovina experienced robust real GDP growth rates that averaged 5.3% annually and nominal GDP growth that averaged 12% annually. GDP growth was accompanied by rapid

credit growth financed primarily by foreign euro area banks which eagerly entered the Bosnian and Herzegovinian financial services market. Through 'greenfield" investment and merger, banks primarily from Austria, Germany, and Italy quickly established subsidiaries⁶ and seized market dominance. By 2006, 90 percent of commercial bank assets in Bosnia and Herzegovina were controlled by foreign owned banks, the top three of which owned 45 percent of total bank assets.⁷

3.1. Role and purpose of foreign liabilities.

According to the IMF (2007) the 23 percent annual growth in credit to the real private sector between 2001 and 2006 was financed primarily from capital inflows. (p. 59). The credit-to-GDP ratio reached 54% in 2006 and by 2009 was nearly 60% of GDP. Parent bank-related inflows were the major source of the increase in international reserves of the currency board and foundation for the growth of the broad money supply, M2, which grew at an average rate of 21% between 2000 and 2008.

Parent bank short and long-term loans to their subsidiaries flow into the commercial banking system primarily as foreign liabilities (non-resident deposits). In 2008, of all foreign liabilities held on the consolidated balance sheet of banks, 93 percent belonged to parent

bank groups.⁸ By the end of 2006, foreign liabilities reached 25 percent of GDP, and in 2009 one-third of all commercial bank deposits belonged to parent bank groups!⁹ Foreign liabilities play two roles: they serve to provide the long term liabilities against which long term domestic loans are issued, and they provide the funds to finance domestic consumption and investment demand.

Banks operating within a CBA, like banks in any capitalist economy, face liquidity challenges owing to mismatches in maturity between deposits and loans. In fact, the risk of maturity and currency mismatch in the banking system of Bosnia and Herzegovina is pronounced. In 2008, nearly half of all deposits were held as very short-term demand deposits, but three quarters of all loans were long term. Even though only 33 percent of resident deposits were either euro denominated, nearly 70 percent of all loans were either euro denominated or euro indexed. Within the household sector, 90 percent of loans were issued as long term but only 58 percent of household deposits were long term. (CBBH 2009b) These mismatches tug at banks to maintain high excess reserve ratios and to hold secondary reserves.

The holding of secondary reserves and the demand for parent bank loans are tied. As Gedeon and Djonlagic (2009) explain, the need to convert short term resident liabilities into long term loans cannot be satisfied through either central bank overdraft/discount window facilities

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	KM millions (unless otherwise noted)					
	2004	2005	2006	2007	2008	2009
Foreign Liabilities, FL*	2,652	3,560	4,034	5,160	6,309	5,747
Domestic Deposits (inc. Government)	5578	6876	8838	12,139	12,024	12,188
FL as a % All Bank Deposits (%)	32	32.5	31	30	34.5	32
Foreign Assets of Banking System	1,906.1	2,096.6	2,328.6	3,548.4	3,098.0	2,970
Net Foreign Liabilities, NFL	746	1,462.7	1,704.2	1,611.1	3,211.7	2,777
Credit to Domestic Sector	5,882.9	7,495.7	9,241.5	11,823.4	14,287.3	13,757
GDP	15,786	16,928	19,121	21,647	25,100	23,950
Consumer prices annual growth rate (%)	0.4	3.8	6.1	1.5	7.4	0
Broad Money, M2	6831.6	8075.1	10,032.2	12,211.7	12,701.5	12,998.3
NFL/Credit to private sector (%)	12.7	19.5	18.4	13.6	23.3	20.2
Growth in Credit to private sector (%)	15.8	27.4	23.3	27.9	20.8	-3.7
FL/GDP (%)	16.8	21	21	23.8	25	24.6
Monetary Base Growth, Year on year (%)	24	22	27	23	-8	1
Broad Money Growth, year on year (%)	25.3	18.2	24.2	21.7	4.0	2.3

*Nearly 93% of all foreign liabilities on the consolidated balance sheet of commercial banks are those deposits and loans of parent bank groups to their Bosnian-based subsidiaries. (CBBH)

Source: CBBH, Bulletin 2009b

Table 3: Selected Data: Bosnia and Herzegovina 2004 - 2009

or via the domestic capital market. Therefore, quasi central bank intermediation has developed. Once a long term corporate or real estate loan has been negotiated, the Bosnian subsidiary moves foreign assets (secondary reserves) to the parent bank abroad to serve as collateral against a loan that the parent bank will now create for the subsidiary. This loan appears as new foreign liabilities of the commercial bank. The bank can sell some of the foreign exchange to the currency board, holding the domestic currency as reserves against the new foreign liabilities while the currency board shows an equal increase of its foreign currency assets against the new increase in reserves. In this process the consolidated balance sheet for the commercial banks shows an increase in foreign liabilities, and the balance sheet of the currency board show an increase in assets. This is the process that Goodfriend and King (1988) term "unsterilized discount window lending." It explains how the broad money supply grew by over 20% each year since 2000.

The inflow of capital between 2000 and 2008 was largely absorbed by the nontradables sectors, namely consumer durables, real estate, financial, and construction. Approximately 47% of total credit to the private sector went to households as variable rate long-term loans.¹⁰ (CBBH/2009b) Between 2001 and 2006, the average real growth of credit to households was 50% while the average real growth of credit to enterprises was 13.5%.

Obviously domestic saving is negative, and the use of foreign saving to finance consumption and investment explain the hyperactive growth in the money supply, but it has also created a precarious external position for the country because of the pressure to service the debt. The CBBH estimates that between 2006 and 2008, the deficit on the current account was financed in the range of 37 – 52 percent through capital inflow into the banks in Bosnia and Herzegovina. (Hadziomeragic 2009, 202)

The monetary authorities have one tool available to soak up excess reserves and to prevent an explosive expansion of the money supply, namely requirements on reserves. In an attempt to slow the growth of credit, the bank regulatory agencies in each of the two entities of Bosnia and Herzegovina increased the required reserve ratio. In September 2004 the reserve requirement was increased to 7.5%, and in December 2004 to 10%. From December 2005 – December 2007 it was 15%, and was raised to 18% in January 2008. However, it is widely acknowledged that these efforts were mostly of a signaling nature and had little impact on constraining credit growth. (Gedeon 2009; IMF 2007)

A highly leveraged economy can produce impressive economic growth statistics, but it also invites financial fragility and increases vulnerability to contraction or slowdown of capital and financial flows. The speed of the credit expansion suggests that banks may have underestimated the level of risk associated with its lending program, especially in light of the fact that rapid and protracted credit growth can mask signals that the nonperforming loans may be on the rise.¹¹ Furthermore, financing through foreign channels means that principal repayments increase over time, and they demand a trade surplus if the country's external position is to stabilize or decline relative to the size of the economy. (IMF 2008) In Bosnia and Herzegovina there are multiple sources of financial fragility, including the following:

Household indebtedness. The World Bank refers to the debt levels of the country's households as "worrying." (World Bank 2009) From the standpoint of debt burden, by 2007 the average debit card debt was consuming 41 percent of net wages, and the median household was carrying balances that had hit the approved ceiling. In 2007 almost 40 percent of households spent 20 percent of their income for debt repayment, and as many as 16 percent of households spent more than 30 percent of income servicing debt, while 15 percent of households with debt had no income whatsoever. (p. 33)

Dependence on workers' remittances. The economy is highly dependent on workers' remittances, accounting for 20 percent of GDP. This places Bosnia and Herzegovina fifth in the world and first among its Balkan (Cirasino and Hollanders 2006) neighbors. The economic slowdown in 2008 reduced the inflow of money remittances from abroad by 6.7 percent, placing more stress on households to meet current liabilities. (CBBH 2008a, 39) Stress tests conducted by the World Bank show that given the high personal and corporate debt levels denominated in euro, the slowdown in remittances to Bosnia and Herzegovina substantially raises liquidity risk and overall financial fragility. (World Bank, 2009, 37)

Rising wage and price levels. Although moderated during the global crisis, inflation accelerated sharply between 2005 and 2009. The global rise in food and fuel prices contributed, but the fundamental cause of domestic inflation has been demand driven. The World Bank noted in 2009 that "domestic demand has risen too fast and is the source of the observed surge in the price



Note: Due to data availability for countries with an asterisk data are for 2006 Source: Shelburne, p. 9 (http://works.bepress.com/robert_shelburne/38/) Figure 2: Current Account and Basic Balances in European Emerging Markets 2007

level. Signs of intensifying demand pressures are sharp growth in net wages and expanding current account deficit." (p. 4) Despite an unemployment rate of 20 percent, wage growth rose sharply between 2007 and 2008. With increases in public sector wages spilling over to the private sector, there is concern about the impact on public finances and export competitiveness. (World Bank 2009; IMF 2009b)

Current account deficit. Bosnia and Herzegovina has experienced chronic and widening balance of trade deficits which have contributed to double-digit current account deficits. (See Table 4) Although its current account position improved slightly in 2006 and 2007 (due in part to the rise in world metal prices), it remains at 20 percent of GDP. As Figure 2 shows, among the 27 emerging European markets in 2007, only Latvia and Montenegro had higher current account-to-GDP ratios.

The high current account deficit is of concern for a number of reasons. First, the current account deficit has been primarily financed from long-term commercial bank borrowing and other FDI (IMF 2008). This carries with it the burden of investment income and principal repayments over time. Second, as Table 4 indicates, the trade deficit has worsened over time. It grew by 17 percent in 2007 and 16 percent in 2008, largely because of the growth in imports. (CBBH 2008a) Its narrowing in 2009 was due to a dramatic fall in imports, attributed to the income effects of the global recession. Third, the BH

export base is narrow. Bosnia and Herzegovina sends 45 percent of its exports to neighbors Croatia, Slovenia, and Serbia, making it dependent on the economic climate of the region. And fourth, nearly one quarter of its world exports are in semi-finished metal products which are highly sensitive to world metal prices. (IMF 2009a)

A current account is often viewed to be problematic if it is unsustainable, that is if the current account is creating an increasing debt-to-GDP ratio. A widening current account deficit and growing current account-to-GDP ratio can mean that the pace of growth of domestic demand cannot be sustained, especially if external financing is unstable. While the IMF (2009a) was optimistic that the BH current account deficit was sustainable, its stress tests were conducted before the global economic slowdown.

3.2. Global Financial Crisis: Monetary Policy Intervention

The global financial and economic crisis of 2008-09 put the banking system and currency board under great strain. International banking groups withdrew liquidity from the local subsidiaries between March and September 2008, and when news about parent bank losses became public, it triggered a brief run on the banks. Between October 2008 and May 2009, the currency board lost 16% of its reserves. (IMF 2009a, 5)

						KM millions
	2004	2005	2006	2007	2008	2009
Current Acct	-2,579	-2,933	-1,505	-2,261	-3,734	-1,807
 Goods 	-7,193	-7,749	-6,661	-8,101	-9,426	-6,663
 Services 	678	873	1,034	1,212	1,344	1,049
 Income 	798	737	649	773	800	509
 Transfers 	3,137	3,206	3,472	3,863	3,606	3,297
Capital Acct	1,970	2,641	1,245	2,063	3,934	1,781
 Capital 	474	443	457	432	388	347
 Financial* 	1,496	2,197	788	1,632	3,546	1,434
Current Account Balance/GDP (%)	-16.3%	-17.1%	-7.8%	-10.4%	-15.1%	-7.5%

*The financial account includes FDI, portfolio and bank transfers, and the reserve assets.

Source: CBBH. Bulletin 2009b, 2010

Table 4: Balance of Payments: Bosnia & Herzegovina

The fourth quarter of 2008 was most dramatic. During the fourth quarter of 2008, foreign exchange reserves of the currency board contracted by 8%--the largest decline recorded in a single quarter. This was due to the 17% drop in bank reserves (KM 705 million) from the withdrawal of deposits from the banks. The decrease of foreign exchange brought about a fourth quarter contraction of the monetary base by 9% and a contraction of the broad money supply, M2, by 4.8%. Compared to the second quarter of 2008 which saw a 5 percent increase in the broad money supply, the "whiplash" was significant: a quarterly decline in M2 of 9.8 percent. (CBBH 2008a, 36 – 42)

Amidst fear that their parent bank credit lines would be cut, worry about maturity mismatch and illiquidity due to loss of deposits, and concern about increased moral hazard, commercial banks responded by slowing down lending to the private sector, increasing holding of excess reserves by 14% and of foreign assets (secondary reserves) by 8.6%.¹² Interest rates were raised to 12% on loans to households and nearly 11% to enterprises. The combined effects of (i) the screeching halt in balance sheet growth, (ii) the currency board's loss of foreign exchange reserves, (iii) rise of interest rates, and (iv) whiplash contraction of the money supply caused the monetary authorities to sound the alarm bell. (Nezavisne Novine, October 27, 2008) Policymakers in the Agencies for Banking as well as in the Central Bank became increasingly concerned that foreign-owned banks, despite their declared long-term interest in Bosnia and Herzegovina (as well as the region) would choose to cut their losses and run. Because much of the current account deficit had been financed by short-term foreign debt, a capital inflow slowdown or reversal could push the country into insolvency. In an October 2008 interview with Dnevni Avaz, Kemal Kozaric, Governor of the Central bank, indicated that the public's uncertainty about the commitment of foreign parent bank groups to BH could trigger "rational fears" about the liquidity of the subsidiaries.

Initially moral suasion was used to persuade banks to petition the parent for emergency lines of credit. (Kozaric 2009) In response, parent banks moved funds: "other" long term foreign liabilities increased from KM 2 million in August 2008 to KM 62 million in September 2008, and by year end KM 103.5 million.¹³ Taken together, in the third quarter of 2008 foreign liabilities of the commercial banks increased at the annual level of 23 percent. (CBBH, Bulletin, 2008b, 58).

In addition to the petition to parent bank groups for emergency funds, the CBBH implemented three measures that would reduce the costs for commercial banks to maintain deposits in the country. (Kozaric 2009) In October 2008 it lowered the required reserve requirement from 18% to 14% (hoping that banks would lend the excess reserves). Because the effort did not halt the contraction of credit, the CBBH agreed shortly afterward that all new parent bank credit would be entirely free from required reserve calculation, explaining that "This measure was aimed at stimulating the inflow of capital from foreign countries in the local banking sector and providing additional incentives to the credit activity of commercial banks." (CBBH 2008a, 58) Explicitly for the purpose of stimulating larger credit activity, it reduced the reserve requirement again in December 2008, but only on long-term deposits.

There was also fear of a herd effect (collective action problem) among the banks themselves. One European bank group's reassessment of the macroeconomic outlook in Bosnia and Herzegovina or the region could affect the value of the market presence of other bank groups. According to Erik Berglof, chief economist at the European Bank for Reconstruction and Development (EBRD) and Anne-Marie Gulde, senior advisor in the IMF's European Department, parent bank group behavior was key to macroeconomic stability in SEE. With banking systems as highly concentrated as that in SEE, one stakeholder announcing skepticism about the stability of the region could trigger a sudden reversal of capital flows, creating unsustainability of current account deficits and a balance of payments crisis. (IMF 2009b).

In order to prevent a crash in the price of assets which could lead to liquidity crises in financial institutions and further bank panics, a lender of last resort would need to be created to provide emergency liquidity and restore confidence in the banking system of Bosnia and Herzegovina as well as to the region as a whole. А number of international financial agencies shared these concerns, including the IMF, EBRD, European Commission, European Investment Bank (EIB), European Central Bank (ECB) and World Bank. By late October 2008 consensus had been reached among them that measures would need to be taken to prevent foreign banks from pulling capital out of the region. To avert a regional financial crisis, international parent bank groups would need to recapitalize their subsidiaries and agree to maintain their exposure to the region. Lender of last resort intervention would have to be voluntary, and moral suasion would be the monetary policy tool of choice. (IMF 2009c).

The Vienna Initiative, as it was to be known, began work in late 2008 with a consortium of 15 private European bank groups, fiscal and monetary authorities from each country in southeast Europe, and the IMF, EBRD, EIB, World Bank, and ECB. As for the agreement regarding Bosnia and Herzegovina, in return for committing to remain in the region for two years and recapitalize subsidiaries as needed, parent bank groups with exposure in Bosnia and Herzegovina won the commitment of massive international balance of payment support from the IMF, EU, IBRD and bilateral donors. They also won agreements from fiscal authorities to wage controls and other austerity measures to trim domestic fiscal budgets. (IMF 2009c)

In its Request for Stand-by Arrangement to the IMF, the Bosnia and Herzegovina Ministers of Finance with the Governor of the Central Bank listed four primary reasons for this emergency \$1.6 billion infusion of funds. It is noteworthy that at the top of their list was "the safeguard of the currency board." Other objectives included consolidation of public finances, maintenance of adequate liquidity and capitalization of banks, acquisition of sufficient external financing, and improvement of confidence. They noted the 16% loss of the currency board's gross international reserves, the rise in core inflation, the need for public-sector wage restraint, and the vulnerability of the financial system to an increase in nonperforming loans, large shocks in funding costs, indirect effects of depreciation and a deposit run. (IMF 2009a, 1-12).

The worsening of the global financial situation poses exceptionally uncertain prospects: with credit growth coming to a halt and higher funding costs, bank profitability is deteriorating. This necessitates coordinated action, including support of parent banks and home country authorities. To this end, following the staff-level agreement on this program, we will seek a pledge from foreign banks to maintain exposure to their BiH subsidiaries and to recapitalize those as needed over the program period. (p. 8)

The IMF approved a total of \$1.57 billion over a period of 3 years, with the first installment of \$282.37 million made available in July 2009. Funds were transferred to off balance accounts of the CBBH and distributed to the fiscal authorities in each of the entities where they were deposited in commercial banks and monetized.¹⁴ As can be seen in Table 5, the positive balance of KM sales on the currency board shown in July and August 2009 is the result of the inflow of foreign currency funds from the first tranche of the stand-by arrangement in the amount of SDR 182 million. (CBBH 2009a)

		KM millions
Year	Month	Sell-Buy Balance
2006		1,134
2007		1,055
2008		-631
2009		-37
2008	07	136
2008	08	74
2008	09	-4
2008	10	-475
2008	11	-201
2008	12	48
2009	01	-168
	02	-92
	03	-21
	04	-12
	05	-208
	06	-42
	07	473
	08	108

Source: CBBH, Bulletin 2009(b)

 Table 5:
 Currency Board Sell-Buy Balance 2006 – 2009

Far from over The effects of bank reticence to lend was felt throughout 2009; loans to the domestic sector fell by 1.6%, causing the Federal Banking Agency to once again warn that "it should be expected in the upcoming period to see more increasing adverse impacts and effects, especially through a deterioration of the credit portfolio quality, increase of bad placements, and consequently credit losses, which will have an adverse reflection to the financial result of banks." (FBA, 2009, p. 23).

There has been strong resistance to austerity measures proposed by the IMF, especially regarding the imposition of restraints on public wages and the reduction of public spending. But in its First Review under Stand-By Arrangement, the IMF noted that despite a projected decline in GDP and continued fiscal deficits, "The financial sector has coped well with the crisis. The commitment of foreign parent banks to maintain their exposure vis-à-vis Bosnia and Herzegovina and to keep their subsidiaries well capitalized has had a stabilizing effect." (IMF 2010)

4. Conclusion

The currency board is presented as a rules-bound, neutral monetary institution which promotes market discipline, confidence, and fiscal conservatism by means of prohibiting lender of last resort to government or banks, maintaining the fixed exchange rate, and encouraging open capital markets. The prevailing idea is that the only way for the board to acquire new reserves is to obtain foreign exchange from the reserve currency country, and this implies that the CBA country must run a balance of payments surplus.

The rigidity built into the CBA implies that the burden of macroeconomic adjustment falls on the banking system, and through it, on the economy as a whole. Any kind of a crisis that causes a drain of currency and consequent contraction of the monetary base must result in rising interest rates to equilibrate financial markets and a contraction of banks' balance sheets and/or borrowing of reserves from abroad. It relies on prompt and complete adjustment of prices to match demand with supply in its factor and product markets.

But the literature boasts further that the benefits of a currency board arrangement is that the fixed exchange rate and open capital market increases credibility and lessens the vulnerability of a country to destabilizing capital flows. Wessels (2006) summarizes this most succinctly: A CBA not only simplifies the operation and monitoring of the foreign exchange market, but, because it increases credibility and reduces uncertainty, also lessens the vulnerability of a country to destabilizing capital flows and their concomitant contagion. In this way, the CBA facilitates access to international financial markets and participation in external trade. The latter may enhance foreign direct investment and allow the country to tap into the financial markets of the anchor and other countries in the common currency area. (355)

The literature misses the point that parent bank groups are re-created as private central banks although no legal relationship between subsidiary and parent bank binds them. Capitalist finance requires a transformation of short-term liabilities into long-term assets. Absent a domestic capital market and/or central bank discount window, this places the burden of liquidity management on the tenuous relationship between the subsidiary and parent bank group. The unintended consequences are that "discount-window" type loans are monetized and directly increase the monetary base of the currency board, fueling hyperactive credit growth. Hesitancy on the part of the parent bank to maintain the overdraft services can lead to a "sudden stop" set of problems and destabilize the system.

An issue discussed in this article is why banks expand so much credit, given known risks that can lead depositors and shareholders into trouble at business cycle turning points. While it does not seek to explain the motivation of parent bank groups, it clearly demonstrates that money supply endogeneity is rooted in decisions by foreign banks regarding exposure to Bosnia and Herzegovina and the region as a whole. Minsky (1985, 1986) believed that the post WWII free market economy has a natural tendency toward financial instability on the aggregate level. In good times, agents consume and invest, generating more income, acquiring the funds from accommodating financial institutions and central banks. As euphoria and gregarious behavior pick up, herd behavior leads to more speculative or even "ponzi" finance. The boom is fed by an over-expansion of bank credit until some exogenous outside shock to the macroeconomic systems ends it. The ability of the banks to acquire funds from its parent bank at a relatively cheap price implies that unless (and until) the bank (or its parent) decides that acquiring the funds may be harmful to its own long run profitability or solvency, it will continue to lend. A kind of independent, private, and

decentralized open market operation provides desired liquidity to accommodate the needs of the corporate sector.

Throughout the credit growth period of 2002-08, the CBBH observed the stimulating effects of the inflow of parent bank group funds—annual 25 percent growth of the money supply, 12 percent growth of GDP, and brisk growth of consumer demand. It tried to constrain the growth with increases in the reserve requirements, but with little effect. The CBBH also noted the negative effects of such rapid inflow of bank capital—the growing net foreign liabilities, gaping current account deficits, increase in the price level, and rising debt levels of households.

The breakdown in the resolve of the CBBH/currency board to refrain from using monetary policy occurred during the world global economic crisis when credit from abroad dried up and domestic depositors, fearing bank pullout, withdrew deposits. We have seen that the "whiplash" effect created such concern on the part of the currency board that it was compelled to reinvent lender of last resort monetary policy. An 8 percent loss of gross foreign exchange reserves forced not only the creation of a consortium of private foreign banks to function as "Big Bank lender of last resort" but also a quid pro quo that the IMF and other international financial agencies act as "Big Spender of last resort." To the extent that CBBH/currency board used its own tools of monetary policy, namely changes in the reserve requirements, it can be said that this was in reaction to actions taken by banks to first fuel a credit expansion and then to halt credit expansion.

This suggests that the nature of monetary endogeneity is more in line with a Post Keynesian analysis. During the 2002-07 period of rapid credit growth, the process can be outlined as: loans $\uparrow \rightarrow$ foreign reserves $\uparrow \rightarrow$ monetary base $\uparrow \rightarrow M2\uparrow$. This may call forth reaction by the central bank to raise reserve requirements to mop up some of the money supply, but this is in reaction to actions taken by banks to fuel a credit expansion. With loans financed by low cost financial liabilities from parent banks located abroad, this process raises the question of when will financial fragility (rising leverage and household debt, current account deficit, slowdown in remittances) become a Minsky moment with a surge in capital flows in the reverse direction.

During the 2008 financial crisis, parent banks' reassessment of their own financial fragility led to withdrawal of support of subsidiaries, and the process reversed. Capital inflows slowed down, creating

conditions of systemic illiquidity that forced the monetary authorities to intervene: loans and deposits $\downarrow \rightarrow$ foreign reserves $\downarrow \rightarrow$ monetary base $\downarrow \rightarrow M2 \downarrow \rightarrow$ creation of international LLR.

This paper has challenged the prevailing argument that under a CBA monetary policy is rendered passive or is deactivated by motivating the reasons within the rules of the CBA that call forth monetary policy reactions by the central monetary authorities. It has attempted to develop an analysis that shows that when profit-seeking banks identify potential borrowers who meet the banks' risk threshold, they negotiate the loan and then refinance their portfolios to cover whatever cash drain that might arise. The paper suggests that contrary to the literature on currency boards that boasts the retirement of monetary policy under currency board regimes, monetary policy, especially open market operations and lender of last resort lending, is carried out under the cloak of conversations between the currency board and the representatives of the parent banks. In short, monetary policy under the currency board regime in Bosnia and Herzegovina has been privatized and decentralized, not abandoned. 🖪

Endnotes

- 1. The discrepancy is due to earnings on foreign exchange deposits held abroad. CBBH, Bulletin, 2009a, 54.
- 2. Steve Hanke explains the mechanism in the following way:

A balance of trade deficit causes gold to flow out of the country. This causes the domestic money supply to shrink and domestic interest rates to rise. A rising interest rate has two effects: (i) it discourages new loans which causes income to drop, domestic prices to fall, and a real depreciation of the exchange rate. This creates the conditions for re-establishment of equilibrium on the current account as imports, Z, fall and exports, X, rise. (ii) if the domestic interest rate exceeds world interest rates, it encourages foreign capital (gold) inflows, K, as foreigners buy securities denominated in local currency. The money supply is restored.

According to Federal Reserve of Boston Vice President Richard Kopcke,

Currency boards essentially enforce modern versions of the venerable specie-flow standard, which in the past commonly took the form of a gold standard. In theory, a country that varies its supply of base currencies adopts a monetary regime that automatically regulates the level of its prices and the growth of the economic activity. For example, when the prices of the country's factors of production, goods, and services in world markets rise more rapidly than the prices for other countries, its balance of trade deteriorates, causing its holdings of reserve currencies and base money to grow more slowly. Its domestic supplies of money and credit also decelerate which raises its domestic interest rates and

reduces the demand for its factors and products, thereby depressing its prices relative to those of other countries. (p. 26)

3. Dornbusch and Giavazzi (1999) mention that currency boards could require banks to secure agreement from foreign financial institutions that they be provided with lender of last resort services, privatizing lender of last resort and regulatory services. But he doesn't address the issue of parent bank distress during crises and capability of fulfilling the obligation.

4. The region is defined as including the following countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the FYR Macedonia, Montenegro, Serbia, and Romania.

5. "The dominance of nontradables sectors is likely to reflect strong expectations of real appreciation as incomes converge to EU levels. This makes returns in nontradables more attractive. The investments may also have been influenced by weak institutional frameworks that make investing in activities with short pay-off periods, such as trade and real estate, more appealing than manufacturing. However, the appreciation expectations may overshoot. Together with the apparent currency mismatch, the increase in liabilities in nontradables sectors can affect the countries' ability to service debt liabilities over time, especially should there be large movements in the exchange rate or a slowdown in growth." (Sorsa et. al., p. 13)

6. Unlike branches, subsidiaries are separate entities, and the parent bank is not responsible for the subsidiary's liabilities; financing of the subsidiary depended on the relationship between it and the parent bank. (Hadiomeragic, 193).

7. Raiffeisen Bank, UniCredit, and Hypo Alpe-Adria Banks are the largest.

8. CBBH. Data prepared at request of author.

9. Federal Banking Agency, Bosnia and Herzegovina. Data prepared at author's request.

10. Foreign direct investment is often cited as the driver of export development, but between 2004 and 2007, manufacturing accounted for only 20 percent of the total FDI inflows and metal industries 6 percent. Most FDI was absorbed by the nontradables sectors: the financial sector absorbed 41 percent of FDI over 2004-2007 followed by telecommunications (26% in 2007 alone due to the privatization of Telekom Srpske). (Kaminski and Ng, p. 18)

11. Kemal Kozaric, Governor of the CBBH, is reported to have said that nine banks together recorded losses from non-performing loans totaling \$15.1 billion in 2009—approximately 2.8% of commercial banks' total assets--and that they would most likely have to "dive into their capital assets to cover the loss." In "Bosnia's Banks Must Tackle Bad Loan Rise." December 11, 2009. *Syminvest* http://www. syminvest.com/market/news/microfinance/bosnias-banks-must-tackle-bad-loan-rise-/2009/12/11/2181.

12. CBBH. Data prepared at request of author.

13. CBBH. Data prepared at request of author. The Federal Banking Agency reported that "as a result and consequence of the global financial crisis, domestic banks in the FBiH owned by foreign banking groups have received a significant financial support from the groups, through a long term and short term/revolving credit line (increase in the

fourth quarter of KM 277 million), deposits (increased in the fourth quarter by KM 208 million), new stand-by arrangements and, finally, through inflow of new green capital, which only over the last three months of 2008 amounted to KM 130 million, the capital base of individual banks and the entire banking sector of the FBiH has been strengthened." (2009a, p. 26)

14. Interview, Milan Cuc, Resident Representative, International Monetary Fund, February 2010, Sarajevo.

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Determinants of FDI in Czech Manufacturing Industries between 2000-2007

Eva Michalíková, Elisa Galeotti*

Abstract:

The Czech Republic (and its manufacturing industry) has been a successful recipient of foreign direct investment over recent years. Therefore, it is important to understand the decisions made by foreign investors where to place their investments and how to decide on their location between alternative industries. The aim of this paper is to find and estimate an econometric model describing the determinants of foreign direct investment (FDI) in the manufacturing industry of the Czech Republic between 2000-2007 and to make a review of recent literature on the topic. The econometric model includes several economic variables (for example labor, physical capital, R&D, profits per labor, Balassa index). Together with simple techniques of estimation (OLS, fixed effects) we used a generalized method of moments (GMM). In an effort to improve the result we used also a least trimmed squares estimator (LTS) from the class of robust estimators as a diagnostic tool for the heterogeneous pattern of data.

Keywords: FDI, manufacturing industry, Czech Republic, GMM

JEL: C01, C23, C51, C82, F21, F40

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1. Introduction

It is important to understand the decision making process of foreign investors as to where they place investments. Foreign direct investment (FDI) can provide a firm with new markets and marketing channels, cheaper production facilities, access to new technologies, products, skills and financing. For the host country or the domestic firm which receives the investment in the form of M&A, it can provide a source of new technologies, capital, processes, products, organizational technologies and management skills, an increase in employment and competitiveness. Therefore, FDIs can give a strong impetus to economic development. On the other hand, the presence of a FDI can bring some hazards: hostile takeovers with the aim of dampening domestic production in that field so that the foreign parent company has less competition, the crowding out of domestic savings by foreign savings, the forced transfer

of domestic savings abroad under unfavorable conditions, an increase of wages in sectors with foreign ownership overspill to sectors with domestic firms in which the labor productivity grows at a slower pace, and many others.

The Czech Republic has been an intensive recipient of

* Eva Michalíková
Charles University, Institute of Economic Studies,
Prague, Czech Republic and
Faculty of Business and Management, Brno University
of Technology, Brno, Czech Republic
E-mail: michalikova@volny.cz

Elisa Galeotti

Charles University, Institute of Economic Studies, Prague, Czech Republic E-mail: elisagaleotti@seznam.cz foreign capital during the last 15 years. In 1995, FDI in the Czech Republic reached 195,5 billion CZK, in 2000 818,3 billion CZK and in 2005 1491,6 billion CZK. For years the manufacturing industry was a leading recipient of FDIs even as in recent years the share of manufacturing decreased. In 1995, the share of manufacturing was 64%, while after 2000 the share of inflows of FDI moved to around 38% and this trend has continued till the present time. Data describing flows of FDI to Czech Republic are summarized in Table 1.

Year	Total FDI stock (billions CZK)	Anual increase (billions CZK)	Share of manufacturing (%)
1995	195,5	-	64
1996	234,3	39	65
1997	319,8	86	55
1998	429,2	109	46
1999	631,5	202	39
2000	818,3	187	38
2001	982,3	164	38
2002	1165,5	183	46
2003	1161,8	-3,7	42
2004	1280,6	119	40
2005	1491,6	211	38
2006	1666,8	175	36
2007	2032,1	365	37

Table 1: Stock of FDI in Czech Republic and in manufacturing industry,1995-2007. Source: CNB, own calculation.

Many authors of economic papers and empirical studies are interested in the problem of foreign direct investment and its determinants. Many analyses have considered the problem of the determinants of FDI in the Czech republic and have played an important role in the previous literature (Zamrazilová, 2007; Kadeřábková, 2007; Blonigen, 2005; Benáček, 2000; Benáček and Zemplinerová, 1997; Smarzynska and Spartareanu, 2004; Mody, 2004; Mody, 2007). In the case of determinants, the thrust of the research has focused on why foreign investors prefer some countries over others (crosscountry analysis) or why some sectors dispose of higher flows of foreign capital (cross-industrial analysis) (Benáček, 2000). The second approach has most of its hypotheses in microeconomic theories of production allocation. Many take the classical approach of the application of theories of comparative advantages. However, a substantial part is derived from the new theories of allocation and trade, theories of industry organization and economic geography (Krugman and Obstfeld, 1997 or Dunning, 1980, 1998 and 2000). Moreover, these analyses are based on the theory of specialization (Yang and Ng, 1993).

An econometric model for the analysis of FDI can therefore explain FDI as a function of many factors (Blonigen, 2004; Francis, Zheng, Mukherji, 2009). One of these factors is the size of the market. Such results were presented in studies by Lankes and Venables (1997), Savary (1997), Pye (1998), Walsh (2010) and Altzinger (1999). In other empirical studies, the authors show the important role played by foreign investors in the expected growth of a market (Barrell and Holland 1999) or access to a market (Amiti and Smarzynska Javorcik, 2005).

The size of foreign capital can be influenced also by labor costs (Savary, 1997; Pye, 1998; Holland and Pain, 1998; Bevan and Estrin, 2000; Benáček and Víšek, 1999). Additionally, Pye (1998) also specified other important factors: profitability, the political and economic stability of a country or its access to markets. Stability was important also in the study of Lankes and Venables (1997).

The decision of foreign investors also depends on the level of research and development of domestic firms. Benáček and Víšek (1999) presented in their study that foreign investors preferred investment into manufacturing sectors with higher expenditures in research and development. This contradicts Altzinger (1997) who showed in an earlier study that human capital and know-how were not significant factors in investors' decisions. In contrast, Savary (1997) and Pye (1998) described expert knowledge as very important. It is possible that research and development did not play such an important role as it does today.

Another deciding element within the cross-country analysis can be the process of privatization. In the countries of Central and Eastern Europe three different privatization processes were employed. The first (mostly used in the Czech Republic and Slovakia) was based on the principles of coupon books and the sale of state enterprises to domestic residents was preferred. The second (mainly in the Balkan states) sold state firms to their previous managers. The third (almost exclusively in Hungary) sold state enterprises to strategic partners and implemented certain restrictions on foreign agents. Savary (1997) showed that the regions of Central and Eastern Europe were more advantageous for inflows of FDI than Southern Europe. On the other hand, Holland and Pain (1998) declared that the method of privatization was the most important factor.

There are a number of other important determinants for the presence of FDI; for example in cross-country empirical analyses an important factor can be distance from the countries of Western Europe (Bevan and Estrin, 2000 or Holland and Pain, 1999). Lankes and Venables did not confirm the importance of this factor. Other influences can be natural resources (Kinoshita and Campos, 2003), total factor productivity (Benáček and Víšek, 1999 or Savary, 1997) or bureaucratic obstructions (Pomery, 1997).

There exist two cross-industry studies describing determinants of FDI in the Czech manufacturing industry: Benáček and Víšek (1999) and Benáček and Víšek (1999a). In the first study the authors described the determinants of FDI in the manufacturing sector in 1994, while in the second, they analyzed determinants between 1991 and 1997. The authors concluded that it was not possible to find a universal econometric model describing all the determinants of all sectors in the manufacturing industry. In the Czech economy, there existed two or three groups of industries where the investors behaved differently because their perspectives were different. With the help of robust estimation techniques, they managed to find in both studies that possible determinants of FDI could be, for example, price increases in the industry, total factor productivity, a skilled labor force and/or the profitability of the sectors.

In this paper we will analyze data on 23 sectors of the manufacturing industry between 2000-2007. Our aim is to describe the history of FDI in the Czech Republic and in the Czech manufacturing industry over the last 10 years, analyze important historical events and describe the relevant literature. Finally, we will find and estimate an econometric model describing the determinants of FDI in Czech manufacturing. Our aim is to continue in previous cross-industry empirical analyses and therefore base our study on theories of comparative advantages, theories of allocation and trade, industry organization and theories of specialization and focus in sector analysis.

The paper is organized as follows. Section 2 describes important historical events in Czech manufacturing. Section 3 describes the data and methodology of estimation. Section 4 reports results and section 5 concludes the paper.

2. Privatization in the Czech Republic and FDI 2000-2007

The privatization strategy of Czech Repoublic was three-pronged. Restitutions restored assets to those who had owned firms before they were natonalized by the communist regime in 1948. Small-scale privatization consisted primarily of small economic units that were sold at public auctions. The most important program in the Czech Republic was the Large (Mass) privatization which began in 1991 and concluded in 1995 and covered firms not privatized through the first two programs. This privatization allowed for a combination of the following techniques: holding in tenders (typically small businesses), holding in tenders or to a predetermined buyer (medium-sized businesses) - direct sales, and transforming the largest firms into joint stock companies, whose shares were distributed through voucher privatization (almost one half of the total number of all shares), sold for cash or transferred for free to municipalities (Kočenka and Valachy, 2001).

According to the Annual Reports of CNB, the end of 1990s was characterized by extraordinary flows of foreign capital to the Czech Republic. Many large companies were privatized and large foreign trading companies expanded to the Czech Republic. Privatization- especially of financial institutions - and infrastructure contributed substantially to FDI growth.

In 1998, a system of state investment incentives was established and in 2000 a law for investment incentives was ratified. These measures introduced criteria for an award for incentives, for example an income-tax abatement limit for a specific period for newly established or for already existing companies, support for the buildup of infrastructure and/or subsidies for staff training. These incentives were awarded under certain conditions – especially if the investment targeted some preferred sector of the manufacturing industry or underdeveloped regions.

At the beginning of the millennium, the dominant manufacturing sectors were motor vehicles, electric machines, petroleum products, chemicals, and nonmetallic mineral products. In addition, investments in business machines, computers, paper and the food industry have been high. We should mention the year 2005, when more than half of the increase of FDI flows was due to investment in equity, of which the sales of state-owned stakes in Český Telecom and Unipetrol were the largest investment transactions. However, the expansion of existing foreign investments also accounted for a considerable share of foreign capital income.

At the end of the period under our consideration (2006 and 2007) there were no major investment projects. With regard to the sector structure of capital invested in the Czech Republic, the situation was the same for the several previous years: the most dominant were services, following by the manufacturing industry. The largest investments in manufacturing were allocated to motor vehicles, petroleum and chemical products.

In the period under consideration, in terms of geographical breakdown the Netherlands, Germany and Austria accounted for the largest share of FDI. Of the CNB statistics recorded between 3000-4000 foreign owned companies, about 70 companies accounted for around half the total FDI.

3. Data and Methodology of Estimation

In this paper, we used a panel of 23 sectors from the manufacturing industry (classified according to the Industrial Classification of Economic Activities -- NACE-CZ divisions, the complete list of industries can be found in the Table 2) between 2000--2007. The number of observations is 184 (=23x8). The time-series aspect of our analysis is very important. Self-reinforcing effects of FDI can be addressed only if there is a time series of FDI. Industries can go through comprehensive reforms during long time periods and a newly made investment could be a follow-up function of past investment. The cross-sectional aspect of this study can also be important due to the difficulty of obtaining sufficiently long FDI data (Kinoshita and Campos, 2003).

	Name of industry
1	Food products and beverages
2	Tobacco products
3	Textiles
4	Clothes wear, apparel
5	Tanning and dressing of leather
6	Wood and products of wood and cork
7	Pulp, paper and paper products
8	Publishing, printing and
	reproduction of recorded media
9	Coke, refined petroleum products
10	Chemicals and chemical products
11	Rubber and plastic products

	Name of industry
12	Other non-metallic mineral products
13	Basic metals
14	Fabricated metal products
15	Machinery and equipment n.e.c
16	Office machinery and computers
17	Electrical machinery and
	apparatus n.e.c
18	Radio, television and
	communication equipment
19	Medical, precision and optical
	instruments
20	Motor vehicles, trailers and semi-trailers
21	Other transport equipment
22	Furniture; manufacturing n.e.c.
23	Recycling

Table 2: List of industries

The data used in this paper come from different sources. The information about foreign capital flows (as a part of information on balance payment) is from the Czech National Bank (CNB). Direct investment according to the CNB includes equity capital, re-invested earnings and other capital covering the borrowing and lending of funds, including debt securities and trade credits, between direct investors and their subsidiaries, associations and branches. Information about the rest of variables is from the Czech Statistical Office (CSO). On this point it is important to stress the fact that data from the CSO each year undergo many methodological changes and revisions. Some data published by the CSO are classified only in NACE-CZ subsections, which are not as detailed as NACE-CZ divisions. Another problem is that some of the data are not accessible to the public. Moreover some data are not available and must be computed with the help of other data. The most substantial problem is the impossibility of obtaining complete data from the 1990's. In comparison with the CSO, information about FDI from the CNB is stable and the numerical data do not change over time.

Our dependent variable is the intensity of FDI. This intensity in the given industry \$i\$ in time \$t\$ is measured by the volume of foreign capital per value added: *FDI/VA* for each year and sector (Benáček and Víšek, 1999), avoiding thus the problem of industry size. Normalization of the stock of FDI by the size of value added requires also that the explanatory variables reflect relative intensities, excluding all size effects.

3.1. Regression Variables

Regression variables were chosen on the basis of the main economic theories of location in an open economy. This allocation can be explained primarily by the pure theory of trade. The location of FDI is closely related to comparative advantages of the industries provided the FDI enters a tradable sector of the economy. A foreign investor would not enter into an industry which has no comparative advantage or where returns are low. In our model we commence with a test of factor usage: capital and labor intensities of production, human capital, requirements of natural resources in the industry where FDI can enter. Because FDI entry should also minimize the cost of production, we also include in our analyses indicators for the cost of production - total factor productivity. The changes in relative prices use the Stolper-Samuelson theorem: the changes in relative prices after the opening-up can lead to extensive changes in the allocation of resources and investments (Benáček and Víšek, 1999). We will also include a variable describing profitability or wages. The following explanatory variables will be used in our tests:

Physical Capital and Labor

The first explanatory variable deals with the Heckscher-Ohlin explanation of investment due to comparative advantages given by the country's relative endowments and factor requirements in production. In this paper we will use the combination of the physical capital per unit of net production K/VA and of the labor per unit of net production (L/VA). This variable used in our study is denoted K/L (for each year and sector). Since there has been a general assumption that the presence of relatively skilled labor in post-Communist countries is a comparative advantage that attracts FDI, we expect a positive sign for L/VA: the higher the labor intensity of production is, the more competitive the production in international markets and the more attractive the industry for FDI. Physical capital per unit of net production, as an alternative for labor intensity, is a scarce and too expensive factor and we expect it to be a statistically significant variable with a negative sign (on the condition that there is no multicollinearity. Although multicollinearity does not bias the coefficients, it does make them more unstable and standard errors may be larger (Wooldridge, 2003). We checked for multicolinearity using a correlation matrix and using a variance inflation factor (VIF, see O'Brien, 2007). The results suggest that there are no problems with collinearity in our regressions). With the combination of these two factors, we expect a negative sign for the estimated parameter of K/L, provided the assumption that the post-Communist economies in Central Europe have comparative advantage in labor is valid. K was measured in billions CZK.

Total Factor Productivity (TFP)

This variable is used as a proxy for the technical efficiency of factor usage: the higher *TFP* is, the lower the volume of factors necessary to produce a unit value of output (Benáček and Víšek, 2000). This means that we expect a positive sign for this variable. There are a number of ways how to estimate *TFP*. By considering an aggregate Cobb-Douglas production function we get

$TFP_{it} = VA_{it} / K_{it}^{a} L_{it}^{b}$

where *a* denotes the capital's share of the value added and *b* denotes the labor share of the value added. We suppose that a + b = 1. It is often assumed that the reasonable estimate for *a* is between 0,25 (Prescott, 1998) and 0,35 (Collins, Bosworth and Rodrik, 1996) or *a* is set to 0,3 (Caselli, 2005 or Hall and Jones, 2003). We will take the labor's share in the value added in industry as a proxy parameter *b*.

Change of Nominal Producer Prices over Time (PPI)

This inflationary indicator measures price changes by the producers for their output. The higher this index, the higher the potential for the growth of the industry and investments in this industry. The autonomous industrial price "hikes" can be explained by growing market power (e.g. due to the FDI entry) or the increase in the quality (or the image) of products or simply by a faster world-wide boost in demand for products in the given industry. Thus, a positive sign is expected. The Stolper-Samuelson theorems for location of trade and growth are consistent with this hypothesis.

Labor Cost in the Host Country Relative to the Investor Country (RULC)

Firms will be attracted to industries where labor cost in their sector of activity are low relative to producing elsewhere. A rise in the index indicates deterioration in competitivensess. Therefore, we expect a negative impact on FDI. Relative unit labor cost is computed as the ratio:

RULC_{it}=ULC^{*}_{it}/ULC_{it}

where ULC^{*}_{it} denotes unit labour cost in an appropriately selected partner's country or countries in industry i and year t and ULC_{it} denotes unit labor cost in industry i and year t in the Czech Republic. As parnter countries we také EU15. Unit labor cost is defined as labor cost devided by labor productivity (Havlik, 2005).

Research and Development (R&D)

The quality of the labor or quality of the production and products can also be an important factor for potential foreign investors. CSO offers different sources of information about R&D: the number of people employed in R&D, the number of research workers or the total amount of expenditures on research and development. We decided to use the number of people employed in R&D. The role of R&D has become more important in recent years, and high expenditures in R&D or a high number of workers employed in R&D can also be a sign of high quality. We expect a positive sign for this factor.

Profits per Labor

This variable was included as a proxy for general competitiveness. FDI should be attracted by more profitable firms or the presence of FDI can spill over to higher profits. Thus, a positive sign of this variable is expected. This variable was measured as profits per number of employees. Profits were measured in billions CZK.

Energy Intensity

Energy intensity was included as a proxy for natural resources. We have information about different energy requirements: coal, gas, oil, electricity and petrol. In the last ten years, the worldwide prices of these sources of energy have risen. The prices of energy have grown, especially at the end of the period under consideration. Nevertheless, for example in 2001, the prices of electricity for industry in the Czech Republic were among the lowest in the EU and this trend continued until 2004. The prices in 2005 were not nearly as high as those in some countries in Europe. After 2005, the situation had changed. We suppose that the Czech Republic still has a comparative advantage in natural resources. Thus, we expect a significant parameter of this factor with a positive sign. The variable was measured as energy consumption in gigajoules (GJ) and normalized by value added.

Wages

A higher profitability in industries with higher FDI could spill over to higher wages, especially if there is an inelastic labor supply because of low mobility due to a shortage of flats (Benáček and Víšek, 1999). We expect a significant parameter of this factor with a positive sign. This variable was measured as gross monthly wage in thousands CZK.

Balassa Index of Inter-Industrial Specialization (BAL)

A tendency to relate FDI with higher export specialization to industries is well observed, even though some high export FDI firms can also be important (Altzinger, 1998). Thus we will test a hypothesis on what kind of revealed comparative advantage is associated with FDI. We expect a positive relationship between FDI and BAL.

The Balassa index is computed as the following ratio:

$$BAL_{it} = \frac{X_{it} - M_{it}}{X_{it} + M_{it}}$$

where X_{it} denotes Czech export in industry *i* and year *t* and M_{it} denotes Czech import in industry *i* and year *t*.

3.2. Methodology of Estimation

Among the different possibilities of how to organize and estimate an econometric model we decided to choose the approach of Kinoshita and Campos (2003) or Cheng and Kwan (2000) and to relate current values of FDI to past values of FDI along with other explanatory variables. According to previous studies, the role of past FDI values is formulated as the process of the partial stock adjustment and the time it takes for FDI to adjust to an equilibrium or desired level:

$$Y_{it} - Y_{it-1} = \alpha \ (Y_{it}^* - Y_{it-1})$$

$$Y_{it} = (1 - \alpha)Y_{it-1} + \alpha \ Y_{it}^*$$
(1)

where Y_{it}^* is an equilibrium level of the FDI stock and α is less than 1 for stability. The equilibrium level of the FDI stock is determined by X_{itr} a vector of $k \in \{1...K\}$ explanatory variables described upwards in the previous subsections:

$$Y_{it}^* = \beta X_{it} + V_{it}$$

where v_{it} is an error term including the individual (industry) specific effect and the time specific effect. By reformulating the econometric model (1) we will get:

$$Y_{it} = \delta Y_{it-1} + \lambda X_{it} + \varepsilon_{i \ it}$$

$$\varepsilon_{i \ it} = \mu_i + \eta_t + u_{it}$$
(2)

where $\delta = 1 - \alpha$ and $\lambda = \alpha \beta$ are coefficients to be estimated (β is a vector of dimension 1*xK*); $\varepsilon_{it} = \alpha v_{it}$, μ_i is an individual (industry) specific effect and η_t is a time specific effect. We will analyze model (2) using simple ordinary least squares and fixed effects.

There is one serious problem with estimation of model (2) by simple techniques. The lagged variable Y_{it-1} and error term ε_{it} might be correlated and estimates of such a model could be then inconsistent. Therefore, we should estimate the model with first differences:

$$\Delta Y_{it} = \delta \Delta Y_{it-1} + \lambda \Delta X_{it} + \Delta \varepsilon_{it}$$

Since ΔY_{it-1} and $\Delta \varepsilon_{it}$ might be still correlated we will use the generalized method of moments (GMM). This method is a general estimation principle, where estimators are derived from moment conditions. Arellano and Bond (1991) proposed the GMM (sometimes called difference, DIFF-GMM) estimator that treats the model as a system of equations, one for each time period. The equations differ only in their instrument/moment condition sets. The predetermined and endogenous variables in the first differences are instrumented with suitable lags of their own levels. Arellano and Bover (1995) or Blundell and Bond (1998) proposed the System GMM (SYS-GMM) estimator to give considerable improvements over DIFF-GMM in small samples. SYS-GMM is based on a system compound of first-differences instrumented on lagged levels, and of levels instrumented on lagged first-differences. Since we have a small sample we decided to use a third step of the estimation system GMM estimator. All GMM estimations are carried out using command "xtabond2" for Stata. The validity of instruments is checked by the Sargan test and the second-order correlation of the error term in the firstdifferenced equation is checked by Arellano-Bond statistics, which are asymptotically distributed as N(0,1)(Kinoshita and Campos, 2003). An additional empirical check for small-sample bias is to compare the estimated panel GMM with the corresponding estimates from OLS and simple fixed-effects regression.

However, we must take into account the possibility that our data set is a mixture of industries with heterogeneous behavior among investors (Benáček and Víšek, 1999). This means that it would not be possible to estimate our data by using a simple OLS estimator (which includes all observations in one model). For example, Benáček and Víšek (1999b) analyzed 92 industries of the Czech economy and realized that this population appeared to consist of two segments. The first segment contained industries in which the majority of firms behaved as if in a functioning market economy while the second segment contained industries where firms behaved as if still under socialist paternalism.

Thus, we will use one of the robust techniques of estimation to solve the problem of heterogeneous patterns in data sets. Among the available possibilities we will use a simple Least Trimmed Square estimator (LTS). We can describe an algorithm of this estimator as follows. We consider the standard linear regression model

$$Y_i = \beta X_i + \varepsilon_i$$

For an arbitrary $b \in R^p$ we shall denote by $r_i(b)=Y_i \cdot bX_i$ the *i*-th residual at *b*. Further, we shall use $r_i^2(b)$ for the *i*-th order statistics among the squared residuals. Finally, let us define the LTS estimator by the extremal problem

$$b^{LTS}$$
=arg min $\sum_{i=1}^{h} r_i^2(b)$

where $n/2 \le h \le n$ and the minimization is performed over all $b \in R^k$ (Rousseeuw and Leroy, 1987, Ví\v{s}ek, 1996 and Víšek, 2000). In other words, in this extremal problem we are looking for such an argument $b \in R^p$ for which sum of h smallest squared residuals is minimal. Finally, we built an OLS estimator for these h observations. Unfortunately, we are limited by the dynamic form of model (2). Because of the presence of a lagged value of response variable on the right side of the equation it is not so easy to exclude some observations out of the data set. Instead of this, we decided to exclude a whole industry or industries. Therefore, we will use this technique only as a diagnostic tool to ascertain if the LTS estimator would systematically exclude (almost) a whole industry or industries in (almost) all the years.

	OLS (a)	FE (b)	GMM (c)
Lagged FDI/VA	0,4577***(0,0744)	0,196**(0,078)	0,324***(0,099)
Capital per labor K/L	-0,104***(0,032)	-0,372***(0,132)	-0,123***(0,038)
Profits per labor	0,395***(0,110)	0,181**(0,151)	0,670***(0,160)
R&D	4,682* (2,717)	25,671*** (5,738)	8,602***(3,261)
Energy intensity	0,111***(0,032)	0,142***(0,036)	0,107***(0,037)
Wage	0,051***(0,014)	-0,006(0,040)	0,084***(0,024)
PPI	-0,008*(0,0044)	0,015***(0,004)	0,003(0,006)
TFP	-0,111(0,107)	-0,038(0,140)	-0,176(0,361)
RULC	-0,318***(0,102)	-0,791***(0,128)	-0,319(0,214)
BAL	0,076(0,131)	0,411(0,397)-0,791***(0,128)	0,007(0,143)
Number of obs.	184	184	184
Adjusted R ²	0,86	-	-
Within R ²	-	0,62	-
Sargan test (p-value)	-	-	0,270
AB 1 (p-value)	-	-	0,007
AB 2 (p-value)	_	_	0,475

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors in brackets. Time dummies are included in regressions. Hausmann test rejects the random effects model. Response variable: FDI/VA. **Table 3**

4. Results

In the first step, we report OLS estimation and fixedeffects panel estimates (Blanchard, Gaigné, Mathieu, 2008). However, both pooled OLS and fixed effects of an autoregressive panel model are subject to biases in the estimation of all model parameters. Thus, we also report the results of the GMM system. Finally, in addition to the results of the GMM estimator we will also cement the results of OLS and fixed effects in an effort to compare the results in terms of an economic interpretation. In all regressions the response variable is *FDI/VA*. Table 3 reports the panel regressions: We report pooled OLS and fixed effects models in column (a) and (b) and the GMM model in column (c). All regressions include time dummies to control for time variation due to changes in the economic environment common across industries.

The coefficient of determination for model (a) and (b) is satisfactorily high (86% and 62%, respectively). We present three specification tests for GMM. The Sargan test does not reject the null hypothesis that the overidentifying restrictions are valid. The Arellano-Bond test for AR(2) determined that there is no second order serial correlation. It implies that the model is correctly specified. The coefficient of the lagged *FDI/VA*, , is 0.45 in regression (a), 0.19 in regression (b) and 0.32 in regression (c). This means that the coefficient of partial adjustment α

is thus 0.55 in the case of model (a) and the net investment in one year is 55% of the difference between Y^* and Y. If the steady-state level of the *FDI/VA* stock does not change it will take about 2 years for the gap between the equilibrium and the current value of *FDI/VA* to close.

We can make an analogous conclusion in the case of models (b) and (c) (Kinoshita and Campos, 2003).

The results of all three indicate that physical capital and labor play an important role in the decision of foreign investors where to place an investment. It seems that in recent years investors have preferred a cheaper alternative - investments into labor intensive sectors while investors shunned capital intensive industries. This result agrees with findings of other studies (Benáček and Víšek, 1999 or Savary, 1997) and also is consistent with our expectations.

The variable describing profits in sectors is significant in all regressions with positive signs. According to our hypothesis, profits in industries attracting FDI should be greater than profits in industries with indigenous enterprises. The results of our tests are consistent with these expectations. In regressions (b) and (c), foreign investors emphasized research and development. The results correspond to our expectations: higher expenditures on R&D means higher investments from the side of foreign investors, with higher foreign investments spilling over to higher expenditures on R&D. This variable is significant only on the level of 10% in regression (a). Although this result is not very strong and conclusive, generally we can believe that R&D is important for investors.

The variable describing energy requirements is significant, with a positive sign for the estimated parameter. The prices of energy have risen in recent years, but these changes concerned countries throughout the world. The Czech Republic was characterized by lower prices of energy at the beginning of the period under

	OLS (d)	FE (e)	GMM (f)
Lagged FDI/VA	0,633***(0,074)	0,173**(0,074)	0,410***(0,077)
Capital per labor	-0.123***(0,032)	-0,338(0,226)	-0,115***(0,034)
Profit per labor	2,047***(0,371)	0,776**(0,341)	1,236*(0,728)
R&D	5,669*(2,670)	15,399***(5,620)	7,830***(2,850)
Energy intensity	0,084***(0,032)	0,116***(0,035)	0,112***(0,032)
Wage	0,049***(0,015)	-0,033(0,041)	0,078***(0,021)
PPI	-0,011*(0,007)	0,017***(0,004)	-0,003(0,005)
TFP	-0,058(0,104)	0,012(0,131)	0,139*(0,298)
BAL	0,105(0,127)	0,353(0,376)	0,728**(0,357)
RULC	-0,608***(0,129)	1,332***(0,158)	0,760***(0,126)
Number of obs.	176	176	176
Adjusted R ²	0,88	-	-
Within R ²	-	0,69	-
Sargan test (p-value)	-	-	0,060
AB 1 (p-value)	-	-	0,000
AB 2 (p-value)	-	-	0,108

Table 4: Industry 2 tobacco is excluded. Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors in brackets. Time dummies are included in regressions. Hausmann test rejects the random effects model. Response variable: FDI/VA.

consideration compared to European countries and thus continued the tradition of investments in energyintensive industries. On that account, we conclude that the Czech Republic has a comparative advantage in energy requirements.

Relative unit labor cost is highly significant in all three regressions. It means that increases in relative production costs in the Czech manufacturing industry compared to EU15 countries are expected to have a negative effect on investments into these industries.

The variable describing gross monthly wage is significant for models (a) and (c). These results also conform to our expectations. The variable describing the efficiency of factor usage, total factor productivity, is not significant in any model. Surprisingly, the variable PPI, describing inflation rate, is significant only in regression (b). Our data and these results can be misrepresented by a heterogeneous pattern of foreign investors in some industries. We will try to eliminate this influence by using LTS.

As mentioned above, there exists a certain possibility that our data comes from two or more different sectors where investors behave differently. Moreover, some variables are not significant and the results of the fixed effects regression are not very good. Thus, we tried to apply a least trimmed square estimator to our data and monitored these industries which were deleted by most of the observations of the algorithm. Pursuant to the results, the question becomes whether to drop subsequently tobacco (industry 2) or motor vehicles, trailers and semi-trailers (industry 20). Afterwards we

estimated these reduced data sets by using pooled OLS, a fixed effects panel estimator and system GMM. The results of these estimates are in Tables 4 and 5. In terms of economic explanation, the manufacture of tobacco products is specific: there have been no workers employed in research and development, while on the other hand the ratio *K*/*L* and profits per labor are very high compared to other industries. The sector of motor vehicles, trailers and semi-trailers has a specific position in the Czech Republic and has cardinal importance for the whole Czech economy. The flows of FDI in this industry are extremely high as this sector emphasized research and development, and its profits are higher than those of other industries.

After excluding industry 2 (tobacco) the results of regression (d) and (f) improve only in some details. The coefficient of determination for the model (d) remains high (88%), and the coefficient of determination increases (69%). This means that the models fit the data well. As well as in a previous analysis according to the Arellano-Bond test, a second order correlation does not detect problems and the Sargan test rejects the null hypothesis. This means that the validity of instruments is correct. Overall, a comparison between OLS and GMM results shows a bias that in most variables is not as great as seen in similar sizes of coefficients in both specifications.

Variable K/L has a negative sign and is significant in models (d), (e) and (f). This result supports our previous findings, that investors probably avoid involvement in industries the expansion of which would require a large financial investment in their capital revamping, the alternative being to start expansion in labor intensive and profitable industries, because the variable profits per labor is also significant and positive (in all three models). Significance of *R*&D in all regression reamins unchanging. The level of significance in OLS regression is only 10%. Nevertheless, low p-values in regressions (e) and (f) support our hypothesis that foreign investors emphasize research and development. Variable RULC, which describes competitiveness, is significant in all three regressions with a negative sign. This implies that investors tend toward industries with low labor costs related to productivity.

	OLS (g)	FE (h)	GMM (i)
Lagged FDI/VA	0,5582***(0,074	0,220***(0,079)	0,273**(0,123)
Capital per labor	-0,111***(0,031)	-0,393***(0.131)	-0,120**(0,059)
Profit per labor	0,401***(0,001)	0,125(0,194)	0,698***(0,167)
R&D	6,594***(2,685)	27,350***(5,869)	7,209**(3,541)
Energy intensity	0,119***(0,031)	0,141***(0,036)	0,081**(0,40)
Wages	0,046***(0,001)	0,080*(0,040)	0,091***(0,029)
PPI	0,008*(0,004)	0,017***(0,005)	0,010(0,009)
TFP	-0,105(0,105)	0,001(0,138)	-0,184(0,160)
BAL	-0,016(0,134)	0,522*(0,291)	0,315***(0,132)
RULC	-0,375***(0,101)	-0,791***(0,128)	-0,362*(0,201)
Number of obs.	176	176	176
Adjusted R ²	0,86	-	-
Within R ²	-	0,64	-
Sargan test (p-value)	-	-	0,308
AB 1 (p-value)	-	-	0,078
AB 2 (p-value)	-	-	0,716

Table 5: Industry 20 motor vehicles, trailers and semi-trailers is excluded. **Notes**: * significant at 10%;** significant at 5%;*** significant at 1%.Robust standard errors in brackets. Time dummies are included in regressions. Hausmann test rejects the random effects model. Response variable: FDI/VA.

The variable describing the efficiency of factor usage (TFP) is significant on the level of 10% in regression (f) and this variable has a positive sign. These findings are consistent with our expectations: the higher the TFP, the lower the volume of factors necessary to produce a unit-value of output, making the industry more attractive for foreign investment. However, this low significance does not bring strong conclusions.

The variable describing inflation (PPI) is significant only for regressions (a) and (b). However, the estimated parameter in regression (a) has a negative sign. According to our expectation, the sign should be positive. By a clear look at the data, we can see that this price index is decreasing for several industries, especially those where FDI flows were high during recent years. In industries with higher FDI, the prices can be pressed down and the negative sign can be the effect of the presence of FDI. There is also a statistical explanation of this problem. In general, if the sign of estimated parameters does not correspond to our expectation, this variable could compensate the non-linearity of some other (usually nonsignificant) variable. This means that the "bad" sign of a parameter does not need to be a problem and that we should not rely only on signs of estimated parameters. On the other hand, the level of significance is only 10%. In any case, we will monitor carefully the results of estimating this parameter in the following regression (without industry 20).

The Balassa index is positive and significant in model (f). A tendency to invest in industries with higher export /

import orientation is consistent with this result.The rest of the variables are unchangeable. We can conclude that excluding industry 2 (tobacco) from our data set does not bring substantial improvement.

We will now briefly comment on the results of the last estimated model, where industry 20 (vehicles, trailers and semi-trailers) is excluded. The results are summarized in table 5.

The coefficients of determination of model (g) and (h) are 86% and 64%. Two specification tests of the GMM show a satisfactory result. With the Sargan test we do not reject the null hypothesis that the instruments are well specified and the Arellano-Bond test does not detect second-order serial correlation. In other words, the model is correctly specified.

Let us control the most problematic variables – PPI, TFP and Balassa index. PPI variables in regressions (g) and (h) are significant on the level of 10% and 1%, respectively, TFP is not significant in any model. Moreover, PPI is significant with a positive sign in regression (b). This means that the higher this index, the higher the potential for the growth of the industry and investments in this industry. On the other hand results from regressions (a) and (c) do not bring a similar conclusion. Thus we suppose that this factor is not important for investors. The Balassa index suggests that foreign investors are focused on industries which are export or import oriented. This conclusion supports estimates in regressions (h) and (i). The remaining variables are significant, mostly at a level of 1%.

5. Conclusion

This paper analyzes some aspects of the behavior of foreign investors in the Czech manufacturing industry to learn about the mechanism of allocation of FDI as a descriptive analysis of the decision-making process of investors who discriminate between manufacturing sectors in one single country. Therefore, we focused on sectoral analysis and estimated panel data of 23 sectors of the manufacturing industry over 8 years (2000-2007) by using different techniques of estimation: OLS, fixed effects and primarily by using a GMM estimator. Together with the GMM estimator, we provided several statistical tests controlling the validity of used instruments. One of the most important weakness of this paper, the relatively short time series, is eliminated by certain sensitivity analysis - we estimated nine different regressions, all with the same regressors. The results obtained by simple techniques of estimation mostly correspond to those obtained by GMM.

One of the most important results is the suggestion that the abundance of labor with technical skills is still a comparative advantage in the Czech Republic, while physical capital is relatively more scarce and thus a more expensive factor. Foreign investors prefer industries with a higher guality of labor and flows of foreign capital are closely associated with the number of workers employed in research and development. We conclude that a higher number of these employees effects higher flows of FDI. Foreign capital is also positively associated with energy usage, as foreign investors tend to invest into industries with higher energy requirements. In addition, our hypothesis about profits in these industries was also confirmed in all regression models: industries with higher profits per labor have higher flows of FDI. We suppose that higher profit is the effect of the presence of FDI in industry, which has a circular effect of attracting further investments. Relative unit labor cost is also an important determinant of FDI in Czech manufacturing.

Although there could be more possibilities to exclude industries from our data set (we could take into account also industry - 13 - basic metals or industry 18 - radio, television and communication,, because after excluding one of these industries the results do not change and are very similar to the previous two following regression models), in our analyses we tried to drop 2 different industries out of the model: tobacco (no workers employed in research and development, on the other hand the ratio K/L and profits per labor are very high compared to other industries) and transport equipment (where flows of FDI were extremely high). This exclusion does not bring fundamental improvement to the results - only the PPI index or Balassa index became more significant. However, the parameter TFP remains insignificant.

In conclusion, it is very important to note that at the present time the conditions of the Czech economy are changing. These changes will probably also cause changes in the structure of industries and the drain of foreign capital.

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Determinants of Kosovo Trade: A Gravity Model Approach

Florin Peci, Mario Holzner, Enver Kutllovci*

Abstract:

This study attempts to identify and quantify the factors affecting bilateral trade flows between Kosovo and its trading partner countries using a gravity model. The econometric model is estimated based on both economic and institutional aspects. The results show that family networking with Kosovo emigrants determines to a large extent both exports and imports, while corruption and informality in the partner country seem not to be issues with regard to Kosovo imports. This comes as a surprise given the initial assumption that Kosovo trades more with countries that have a high share of corruption because of informal networks between small and medium enterprises (SME) predominant in Kosovo. The regional CEFTA free trade agreement has a positive effect on both Kosovo imports.

Key words: international trade, gravity model, informality, Kosovo

JEL: F1, P33, E26

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1. Introduction

This study aims to analyse the determinants of current Kosovo trade flows. We have focused on the role of specific determinants like institutional and regional factors. For this purpose a gravity model was estimated.

The Republic of Kosovo as a developing country is entering a new phase in its history as the newest independent state in the world. Domestic governmental

*Florin Peci

Customs of Kosovo-Prishtine E-mail: Florin.Peci@dogana-ks.org

Mario Holzner

The Vienna Institute for International Economic Studies (wiiw), Vienna E-mail: holzner@wiiw.ac.at

Enver Kutllovci

Faculty of Economics, University of Prishtine E-mail: ekutllovci@hotmail.com

institutions have resumed all the responsibilities from the temporary United Nations Administration Mission in Kosovo (UNMIK). Similar to other states in the Balkans, the Republic of Kosovo wants to continue the process of integration into the European Union.

After the 1999 war in Kosovo the United Nations (UN) established UNMIK¹, which immediately commenced a liberal policy of trade characterised by simplicity and impartiality intended to stimulate the private sector and provide for better export conditions. However, this trade liberalisation was not accompanied with an improvement in the competitive ability of the local producing sectors, and unfortunately caused a high trade deficit (Riinvest, 2003).

¹ UNMIK was established in June 1999 with the promulgation of UNSC Resolution 1244(1999) to carry out administration of all sectors of society, including the economy, in Kosovo until a final settlement is found.

The break-up of the former Yugoslavia had a strong impact on labour markets and migration has changed the labour force. Migration flows out and within the area have become a crucial factor of growth and development in all the countries of the Balkans, especially in Albania and Kosovo. The large outflows of population brought significant changes to socio-economic composition and demographic trends. For instance, in Albania almost 20 percent of the population has left the country since 1989. In Kosovo, it is assumed that approximately 25 per cent of the population is currently living abroad (Riinvest, 2007).

The objective of this study is to find out more about the specific determinants of current Kosovo trade flows in a gravity model context. To our knowledge this has not yet been done, also due to the fact that Kosovo Customs has begun collecting higher quality trade data only recently. Moreover this could provide an informative basis for the development of policy recommendations that could improve the trade balance of Kosovo in a free trade environment.

The study is organised as follows: In part one we will provide a general overview on trade policy and trade developments in Kosovo. Part two will deal with the gravity model methodology used and the specific hypotheses analysed. In part three we will discuss the results of our research. Part four will provide conclusions and policy recommendations.

2. Trade policy and trade developments in Kosovo

2.1. Trade Policy in Kosovo

In Kosovo, under the general economic policy of UNMIK, unique and specific fiscal and custom policies were created starting with the creation of comprehensive custom and taxation control of imported goods and establishment of a functioning flexible trade regime with the rest of the world.²

However, it is evident that the economy of Kosovo after the war in 1999 faced many problems that derive from the sphere of the political and institutional set-up, including a privatization process accompanied by high unemployment rates, excessive import growth, a weak export sector and the growth of the budget deficit (Riinvest, 2003). Kosovo is a consumption economy dominated by imports with very low export activity. Current economic activity is mainly conducted by the private sector, which is small in scale. Relatively large inflows of remittances are an important source of income for the economy of Kosovo.

Before 2007, Kosovo had signed FTAs (Free Trade Agreements), with many countries in the region. Afterwards these agreements were substituted by the CEFTA (Central Europe Free Trade Agreement). Kosovo's membership in CEFTA is an important asset for the country, especially with regard to its European integration process. CEFTA rules have been harmonized with the principles of the EU and the WTO. For Kosovo, CEFTA is of paramount importance in improving the competitive position of Kosovo's industries in regional markets and in attracting FDI. In the future process of integration, Kosovo will gear up institutions and policies to comply with the requirements of the WTO. Application for membership to the WTO is a complex process and requires a huge engagement of local institutions. However, membership would ensure full integration into world markets (MTI, 2009).

However, from the beginning of the implementation of CEFTA, the experience of Kosovo so far has not been very positive due to political animosities persisting in the region. UNMIK was a signatory of the CEFTA on behalf of Kosovo (Kosovo's international representation and the negotiating process for bilateral FTA-s and CEFTA were conducted by UNMIK representatives), and Serbia and Bosnia and Herzegovina do not recognize the institutions of the Republic of Kosovo and the documentation issued by them. As a consequence, Kosovo's exports to these countries have been almost at a stand-still for a long time, although there are ongoing efforts to resolve these issues.

It has to be mentioned that the trade policies in Kosovo have been developed in specific circumstances, in a speedy and simple way, by using the Customs of Kosovo as an instrument for realizing the main objective of gathering income for Kosovo's consolidated budget (UNMIK, 2006). However, with the new state the general economic situation has changed. The new circumstances under which Kosovo businesses have developed require the application of new forms of procedures and new general regulations as provided by the basic principles of the WTO.

² According to UNMIK (1999): 'UNMIK, from the beginning of the mission in Kosovo, was determined on a simple trade regime with a two level customs tax: 10% in value for all imported goods according to customs tariff, vis-a vis goods that are released from the payment of customs obligation, a 0% rate. Also since July 1, 2001 this includes the value added tax (VAT) of 15% on value as well as the excise tax on quantity for specific goods'.

2.2. Kosovo Trade Performance

Data published by the Statistical Office of Kosovo (SOK) on external trade provide the following picture. In the period 2001-2008, Kosovo had a negative trend in its trade balance, which by the end of 2008 reached €1730 million (SOK, 2008). In 2008, imports amounted to €1928 million as a result of higher domestic demand. Based on the 2008 Report of the Central Bank of Kosovo, the trade deficit in Kosovo had reached 43 % of GDP by the year 2008 (CBK, 2008). At the same time, exports in 2008 had reached the value of only €198 million. In 2008 exports covered imports by only 10%. In the same year exports increased by 20%, while imports increased by as much as 22%.

The composition of the goods exported from Kosovo in 2008 was generally dominated by raw materials and metals which accounted for around 63 percent of general exports. Chemical products, alcoholic beverages and tobacco accounted for around 32 percent of total exports, while livestock, food, fuel, machinery and other transport equipment, and other raw materials in small quantities made up only 5 percent of general exports (CBK, 2008). With regard to imports, in recent years there has been a slight increase in imports of fuel, machinery and other equipment, chemical products, raw materials, food and livestock. The structure of imports in 2008 remains similar to previous years, with mineral products dominated by oil making up 20 percent of the total. The import of food and beverages comprised 13 percent of total imports. The import of base metals comprised 9 percent of total imports, while transport means made up 7 percent of

Years	Export	Import	Trade balance	lmport coverage
1	2	3	4=2-3	5=(2/3)*100
2001	10,559	684,500	-673,941	1.5
2002	27,599	854,758	-827,159	3.2
2003	35,621	973,265	-937,644	3.7
2004	56,567	1,063,347	-1,006,780	5.3
2005	56,283	1,157,492	-1,101,209	4.9
2006	110,774	1,305,879	-1,195,105	8.5
2007	165,112	1,576,186	-1,411,074	10.5
2008	198,463	1,928,236	-1,729,773	10.3

Source: Statistical Office of Kosovo. **Table 1:** External trade flows of Kosovo. in EUR 1.000 total imports; the rest were imports of different goods (CBK, 2008). An increase of imports of capital goods consisting of machinery, tools and equipment used mainly for production, indicates that productive activity in Kosovo is increasing. The economic growth of Kosovo in 2007 of 3.5 percent is rather low when compared with other countries in the region which reached GDP increases of more than 6 percent in 2007 and less than 6 percent in 2008. Kosovo's economy is small, highly open with imports being around 60% of GDP, and by poor by regional standards with GDP per capita around \$1,448 per year (MEF, 2007). In Kosovo in 2008 there was a somewhat higher increase of GDP by 5.4 percent (CBK, 2008). Foreign direct investment (FDI) in 2007 made up €114 million, or approximately 5 percent of GDP (MTI, 2007).

Kosovo exports at the beginning of 2000 mainly targeted countries in the region due to many institutional and managerial insufficiencies, as well as the lack of knowledge and experience of foreign markets among local exporters. Nevertheless, with time, these difficulties have been reduced. Problems do remain, however, particularly with the recognition of the origins of goods of local producers from some countries in the region that are included in the Free Trade Agreement. Problems in this regard have arisen specifically among countries that are members of the Central European Free Trade Agreement (CEFTA). Kosovo exports to CEFTA members in the region in 2008 account for 31 percent, whilst exports to countries that are members of the European Union (EU) comprise 47 percent. The remaining 22 percent of exports go to other countries (CBK, 2008). In

> 2008 the import of goods from members of the CEFTA comprised 37 percent, imports from the EU accounted for 36 percent, while the remaining 27 percent of imports came from other countries (CBK, 2008).

> CEFTA's impact on the growth of trade exchange between Kosovo and the region was partial. The agreement was not equally beneficial for Kosovo when compared to some of its trading partners. For example, Serbia and Bosnia and Herzegovina since 2007 tried to block many of Kosovo's exports, despite having CEFTA membership. Figure 1 shows that



Source: Statistical Office of Kosovo.

Figure 1: Share of Kosovo trade with CEFTA countries, in % of total (2003-2008)



Source: Statistical Office of Kosovo.

Figure 2: Shares of Kosovo exports to CEFTA countries, in % of total exports to CEFTA, 2008

over the last years the share of Kosovo's exports and imports to other members of CEFTA has been reduced instead of increased.

The main partner among the CEFTA members is Albania, where Kosovo exports more than a third of its overall exports to CEFTA members, about €62 million in 2008. The second partner is Macedonia, with a bit less than a third, while Serbia, Bosnia and Herzegovina and Montenegro make up for most of the remaining third. Exports to Croatia and Moldova are negligible. On the other hand, the major CEFTA import partners are Macedonia and Serbia. The imports from these states make up 77% of all the CEFTA imports, about €718 million in 2008.

3. *Methodology*

3.1. The Gravity Model

Newton's law of gravitation has found applications in the social sciences in the study of human behaviour, and researchers have used gravity models for the empirical analysis of bilateral trade flows in international trade. The gravity model of trade suggests that trade flows between two countries are based on the economic size of each country often using Gross Domestic Product (GDP) as a proxy, and the distance between these two units, using e.g. the distance between the countries' capital cities, as a proxy.

This general model applied in international trade analysis has been an empirical success, but theoretical justification is weak. Tinbergen (1962) is one of the earliest authors that used a simple form of the gravity model of bilateral trade in analysing bilateral trade flows. Also, the gravity equation can be analysed as a partial equilibrium model of export supply and import demand (Linnemann, 1966). The gravity approach could be linked with theories of international trade and expanded by showing that this model could be derived from a Ricardian framework (Eaton and Kortum, 1997), applying the Heckscherer-Ohlin model with perfect and imperfect product specialization. Anderson (1979), Bergstrand (1985), Helpman and Krugman (1985), have shown that price terms in addition to the simple gravity equation variables are also statistically significant in explaining trade flows among countries.

Transport costs are a relevant factor of trade if we consider the production of goods in different countries, which is inconsistent with factor price equalization. These transport costs, for which the distance between the two countries serves as a proxy, determine the volume of the trade flow. Several authors concluded that factors like income and distance between countries were statistically significant and had positive and negative signs, respectively (Oguledo and MacPhee, 1994, Karemera et al., 1999). Transport costs for particular goods are determined by the goods' weight, other physical attributes, location, means of transport, distance, as well as other factors. Frankel (1997) argues that factors causing impediments to trade also come from government policies and institutions.

In this line, North (1990) argues that throughout history government institutions have controversially affected the performance of economies. Countries with good institutions tend to trade more and perform better. Such institutions include Free Trade Agreements and membership in customs unions, which are designed to increase international trade, increase economic development, create a favourable business environment, and attract foreign capital. A study on trade among Central and East European countries by De Benedictis, De Santis and Vicarelli (2005) found evidence that the presence of the Central European Free Trade Agreement (CEFTA) helped to expand intra-regional trade.

Intra-regional trade cooperation in the early 2000s in the West Balkans was initiated by the EU under the Stability Pact as a precondition for creating a network of FTAs in the region. Through CEFTA, participating countries hoped to mobilise efforts to integrate into the EU and other international institutions. Later, under the auspices of the Stability Pact for SEE, the Agreement on Amendment of and Accession to the CEFTA was signed in Bucharest on 19 December 2006. This Agreement replaced all the bilateral agreements previously applied in the region. Full implementation of CEFTA started at the end of 2007. CEFTA envisages an improved mechanism for settlement of disputes that might occur during the agreement implementation, which represents a new quality and a factor of higher security of trade liberalisation in the region. Besides the abovementioned, new areas have been opened for the development of mutual relations with regard to liberalisation of services, investment issues, public procurement, intellectual property, and the possibility for CEFTA cumulation of origin. CEFTA also ensures that mutual trade relations among CEFTA parties should be developed in accordance with WTO rules. This practically implies that even before WTO membership, the systemic setting of the economy should be adjusted to WTO rules, representing a strong factor of predictability and transparency for foreign foreign investors and trading partners, local entrepreneurs.

However, due to weak institutions and late implementation of reforms there are considerable informal trade flows between the SEE countries (see Holzner and Gligorov, 2004). Acemoglu et al. (2001), suggests that institutions that foster the enforcement of property rights, stability, and restrictions on rent seeking behaviour by individuals promote economic activity. It is interesting to note that the results of Duc, Lavallee and Siroen (2008) show that more corrupt countries are generally less trade open, but that two corrupt nations do not necessarily trade less between each other. Thus an informal network effect in trade might exist.

Lately migrant workers' remittances have become an important source of income. In some countries of Southeast Europe, officially recorded remittances take up a sizeable share of more than 10 percent of GDP. Small countries such as Kosovo are highly dependent on remittances as a result of the large portion of their population abroad. There are different theories why migrants are likely to remit when they are willing to return to their country of origin. They send remittances so that they can show their intentions to return and to maintain links with their family. This behaviour possibly generates investment from migrants as well as trading (Lucas and Stark, 1985). In fact, remittances support the growing trade deficit in the majority of these countries. Under these macroeconomic circumstances, remittances play an important role by providing complimentary social protection and correcting for limited government policy interventions. In this respect Ghatak et al. (2009) find evidence that migration from Central and East European countries to the UK positively enhances bilateral trade flows.

Similarly, cultural factors and especially common languages are well-known determinants of trade. This is analysed for instance by Malitz (2008), who describes the channels through which a common language promotes bilateral trade.

3.1. Gravity Model Equations

In our analysis we seek to verify the following hypotheses, which we developed in accordance with the quoted literature as well as the abovementioned specific features of the Kosovo economy and trade policy:

- H₁: Kosovo trades more with large countries measured by GDP.
- H₂: Kosovo trades less with distant countries due to high transport costs.
- H₃: Kosovo trades more with countries with a large Albanian speaking population (Albania, Macedonia).
- **H**₄: Kosovo trades more with countries with a large Kosovo migrant population (Switzerland, Germany).
- H₅: Kosovo trades more with CEFTA countries due to the Free Trade Agreement.
- H₆: Kosovo trades more with countries that have a high share of corruption under the assumption of informal networks between small and medium enterprises (SME).

In order to test these hypotheses we employ a gravity model of trade. A gravity model is usually estimated over a pool of countries for a number of years (Deardorff, 1998; Anderson and Van Wincoop, 2003). However, similar to Vujcic and Sosic (2005) we argue that a single country specification best fits the aim of analysing Kosovo trade specifically. Also, the single country gravity model helps us to avoid troubling specification problems that arise in pooled estimates and issues of heterogeneity in countries. However, its main advantage to a full-fledged gravity model is that it allows extracting differences in export and import patterns separately, following e.g. Summary (1989), Depken and Sonora (2005) and Sonora (2008).

The estimated single country gravity model equations for exports and imports are:

 $ln X_i = \alpha_0 \quad \alpha_1 ln Y_i \quad \alpha_2 ln Dist_i \quad \alpha_3 Lang \quad \alpha_4 Mig \quad \alpha_5 CEFTA \\ \alpha_6 ln CPI_i \quad u_{i \ (1)}$

Where In denotes natural logarithms, Xi denotes the value of exports from Kosovo to country i, M_i denotes the value of imports from country *i* to Kosovo, α_0 is the intercept, Yi is GDP in the destination/source market. Disti denotes the geographical distance in kilometres between the capitals of Kosovo and country *i*. Lang is a dummy for countries with a substantial share of the population speaking Albanian (=1 for Albania and Macedonia, 0 otherwise). Mig is a migrant population dummy for Germany and Switzerland (=1, if true, 0 otherwise). The CEFTA dummy variable takes a value of 1 when countries are members of the Central European Free Trade Agreement (0 otherwise). CPI_i is the Corruption Perception Index, which acts as a proxy for informality in country *i*. Finally, *ui*, is the error term. The data reflect the year 2008. The data on bilateral exports and imports are obtained from the Statistical Office of Kosovo (SOK) as well as from the Customs of Kosovo, and GDP is taken from the IMF's World Economic Outlook (WEO) database. The Corruption Perception Indices are obtained from Transparency International. The distance between capitals was calculated using the 'geod' program, which is part of the 'PROJ' system available from the U.S. Geological Survey.

4. The Results

For the estimation of the import and export equation we performed a stepwise estimation procedure with a backward-selection threshold of a 10% significance level. We started with the full model. The results for the full model can be found in the appendix. Later, all the insignificant variables were removed stepwise. In the case of the single country import gravity model, only the Corruption Perception Index variable was removed, while in the case of the export model both, the GDP of the partner countries as well as the dummy for Albanian speaking countries were removed from the model. It is reassuring that the coefficients of the remaining significant variables as well as the quality of fit of the two models hardly change as compared to the full models presented in the Appendix. It is only in the export model that the coefficient for the corruption variable turns significant after the removal of the two most insignificant variables. Thus this result might have to be analysed with some caution.

Tables 2 and 3 present the results of the respective gravity model estimation, with all the coefficients at least significant at the 10% level. The gravity model that tries to explain Kosovo imports from its trading partner countries is based on a sample of 122 observations and has an R^2 of 68%. Due to heteroskedasticity it was

estimated in a robust way. The partner countries' GDP and the trading distance variables show significant coefficients with the expected signs. In addition we find the coefficients for the dummies of countries with a significant Kosovar migration population as well as of countries that are members of the CEFTA free trade area being positive and significant. In fact the CEFTA coefficient is by far the largest one. Finally the dummy variable of Albanian speaking countries has a positive coefficient, however, only at the 10% significance level.

The export model is estimated on a smaller sample of 48 observations due to the fact that Kosovo exports to only a small number of countries. The quality of the model's fit is at an R² of 59%. In the export model we find from the traditional gravity model variables only distance to be significant. GDP of the partner country was dropped. It seems that in terms of Kosovo exports, the economic mass of the partner country is not important. The single biggest coefficient is that of countries with large emigrant populations from Kosovo. Also the CEFTA

Stepwise, single country, gravity model of Kosovo imports						
	Coef.	Std. Err.	t	P>t	[95%	Conf. Interval]
GDP	1.02	0.09	11.90	0.000	0.85	1.18
Distance	-1.05	0.18	-5.76	0.000	-1.42	-0.69
Albanian	1.54	0.88	1.75	0.083	-0.21	3.29
Migration	1.49	0.38	3.88	0.000	0.73	2.25
CEFTA	2.75	0.93	2.97	0.004	0.91	4.58
Constant	17.14	1.67	10.28	0.000	13.84	20.44

 No. of obs.
 122

 R-squared
 0.6791

Source: Own calculations.

Stepwise, single country, gravity model of Kosovo exports

	Coef.	Std. Err.	t	P>t	[95%	Conf. Interval]
Distance	-1.19	0.33	-3.67	0.001	-1.85	-0.54
Migration	3.50	1.51	2.32	0.025	0.45	6.55
CEFTA	2.53	1.18	2.14	0.038	0.15	4.91
Less corrupt	1.41	0.66	2.12	0.039	0.07	2.74
Constant	17.48	2.85	6.14	0.000	11.73	23.22
No. of obs.	48					

R-squared 0.5875 Source: Own calculations.

Table 3

dummy is significant and positive. In this regression also the coefficient of the Corruption Perception Index is positive and significant. The interpretation is that Kosovo is exporting more to less corrupt countries than otherwise. This comes as a surprise given the initial assumption that Kosovo trades more with countries that have a high share of corruption because of informal networks between small and medium enterprises (SME) predominant in Kosovo. However, our result was confirmed by a recent study on trade and corruption for African economies by Musila and Sigue (2010) that supports the view that corruption adversely affects international trade.

5. Conclusions and policy recommendations

This paper uses a single country gravity model to estimate Kosovo's external trade in terms of imports and exports. While distance appears to be obviously a hindering factor for both exports and imports, a large GDP on the part of the trading partner country is only important in the case of imports. It seems that so far Kosovo exporters were not able to target economically important markets with their products. Family ties with Kosovo emigrants determine to a large extent both exports and imports. It is interesting to note that Kosovo exports more to less corrupt countries. At the same time, corruption and informality in the partner country seems not to be at all an issue with regard to Kosovo imports. Thus it appears that Kosovo traders of legal products are not necessarily involved in international networks of informality. Official trade emerges preferably with countries having low levels of informality. However this might be different for illegal products as well as hidden trade flows. Certainly it is reassuring that Kosovo's membership in the CEFTA yields higher trade shares with member countries. Thus further trade integration, especially with respect to the European Union, might have the positive effect of increasing trade flows.

Given that neither the partner country's GDP nor the Albanian language dummy were significant in the Kosovo exports model the following major policy recommendations can be formulated. Exporting to economically large countries often requires the ability to produce large quantities of tradable goods. In order to exploit gains from international trade, Kosovo economic policy should support local businesses in specialisation and the development of economies of scale. Also, the untapped potential of exporting to neighbouring countries where a large number of population shares a common language should be tackled.

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Appendix

Single country, full gravity model of Kosovo imports							
	Coef.	Std. Err.	t	P>t	[95%	Conf. Interval]	
GDP	1.01	0.09	10.82	0.000	0.82	1.19	
Distance	-1.05	0.18	-5.80	0.000	-1.41	-0.69	
Albanian	1.54	0.89	1.74	0.085	-0.22	3.29	
Migration	1.44	0.40	3.57	0.001	0.64	2.24	
CEFTA	2.76	0.93	2.97	0.004	0.92	4.60	
Less corrupt	0.11	0.36	0.30	0.766	-0.61	0.82	
Constant	17.00	1.66	10.24	0.000	13.71	20.28	
No. of obs.	122						

R-squared Source: Own calculations. Table A1

Single country, full gravity model of Kosovo exports

	Coef.	Std. Err.	t	P>t	[95%	Conf. Interval]
GDP	0.16	0.22	0.72	0.473	-0.28	0.60
Distance	-1.14	0.34	-3.40	0.001	-1.82	-0.47
Albanian	0.95	1.79	0.53	0.600	-2.68	4.57
Migration	3.39	1.54	2.20	0.033	0.28	6.51
CEFTA	2.61	1.35	1.93	0.060	-0.12	5.34
Less corrupt	1.11	0.79	1.40	0.170	-0.49	2.71
Constant	16.73	3.02	5.54	0.000	10.63	22.83

No. of obs.48R-squared0.5947Source: Own calculations.Table A2

R&D Efforts by Indian Pharmaceutical Firms in the New Patent Regime

Pulak Mishra *

Abstract:

In the context of recent amendments to the Indian Patent Act and introduction of the product patent, the present paper attempts to examine the innovative efforts of Indian pharmaceutical companies in the new patent regime. The paper finds that although R&D expenditure has increased significantly in the current decade, the increasing R&D efforts are not widespread across the firms and more than half of the Indian pharmaceutical companies do not spend at all on in-house R&D. This means that protection of intellectual property alone is not enough to encourage the firms towards innovation. Instead, it is observed that R&D expenditure varies directly the with market size of the firms, their capital intensity, exports orientation and past profitability, but inversely with their market share, selling efforts and import intensity. However, a firm's involvement in mergers and acquisition or sourcing of technology from foreign sources or variability in financial performance does not have any significant impact on its R&D efforts. Hence, the policy measures should be directed towards restricting the monopoly power of firms, encouraging exports, liberalizing imports of necessary machinery and equipment, and motivating the firms towards innovation, especially in life-saving drugs, an through appropriate incentive/disincentive structure.

Keywords: R&D, Technology, Competition, Patent, Policy

JEL: D21, D4, L1, L2

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1. Introduction

India's obligation to sign the TRIPS agreement in 1994 to become a member of WTO in 1995 has been followed by three important amendments to the Indian Patent Act (1970), viz., the *Patent First Amendment Act* in 1999, *Patent (Second Amendment) Bill* in 2002 and *Patent (Amendment) Bill* in 2005. On the one hand, implementation of TRIPS has put restrictions on the production of generic drugs and has opened up investment opportunities for R&D of new molecules (Janodia, et al., 2009). On the other hand, the amendments to the Indian Patent Act have made a

*Pulak Mishra

Indian Institute of Technology Kharagpur, Kharagpur – 721 302, India E-mail: pmishra@hss.iitkgp.ernet.in marked shift from the process patent regime towards an era of the product patent. While the first amendment in 1999 introduced the mailbox provisions to receive product patent applications, the second amendment in 2002 extended the term of a patent to 20 years. The amendment in 2005, on the other hand, finally recognized the WTO mandated product patent¹ provision. In addition, the *Pharmaceutical Policy (2006)* also aims at promoting R&D in the industry by creating an appropriate incentive structure².

¹This introduction of product patent regime is expected to have a significant impact on market concentration, prices of drugs and performance of the industry.

²For a discussion in this regard, see Ray (2008).
The existing patent laws are expected to provide greater market power to the firms as an incentive to innovate. But, can the new patent regime necessarily make the firms more innovative, particularly when innovative efforts by the firms have their own set of costs and uncertainties? Further, in addition to patent laws, a firm's decision to invest in innovation may be determined by structural aspects of the market and the firm's relative position therein, alternative strategic options available to the firm, and its ability to invest in R&D. For example, when there are imperfections in the capital market, only the larger firms with stability and internally generated funds can afford to invest in risky R&D. Similarly, when the innovating firms have a larger market, the returns from R&D are also likely to be higher due to the spread of fixed costs of R&D over a large volume of sales. In addition, some other firm-specific characteristics like financial performance, degree of product diversification, export orientation, and import intensity can also influence the R&D decisions of firms³.

In this context, the present paper makes an attempt to examine the innovative efforts of Indian pharmaceutical firms in the new patent regime. The rationale for such attempt lies in the role of R&D in the growth and survival of a firm, particularly in a research intensive industry like pharmaceuticals. The firms with greater innovative efforts experience higher growth rates and also have higher chances of survival (Hall 1987; Doms et al., 1995). With the pharmaceutical industry being technology intensive, enhancing competitiveness is crucial for growth and survival of firms. On the other hand, in-house R&D fails to provide any distinct advantage to firms in terms of their profitability (Mishra and Chandra, 2010) and this may largely be because of their low R&D intensity vis-à-vis the pharmaceutical companies of the industrially developed countries operating in India. In addition, the developing countries may lose by granting patent protection when the costs of patent protection outweigh its benefits (Penrose, 1951; Vaitsos, 1972; Greer, 1973). Developing countries may also suffer from higher prices resulting from patent monopolies. The rest of the paper is divided into three sections. Section II discusses the recent trends in R&D efforts vis-à-vis other technology strategies in the Indian pharmaceutical industry. Section attempts III to identify the factors that influence the R&D efforts of firms. Section IV concludes the paper with necessary policy suggestions.

2. Technology Strategies of Indian Pharmaceutical firms

The nature and extent of innovative efforts of firms in the Indian pharmaceutical industry have changed considerably since the mid-1990s. Not only has the amount of R&D expenditure in the industry increased substantially (Pradhan, 2003; Chaudhuri, 2007), the structure of R&D activities by the Indian companies has also changed from development of new processes to modifications of existing drugs as well as development of new formulations and compositions (Chaudhuri, 2007). R&D expenses have increased at a higher rate of 5.07 percent in the post-TRIPs period as compared to the rate of growth of 3.88 percent in the pre-TRIPS period (Kiran and Mishra, 2009). The industry has become one of the two most important spenders on innovation, the other being the automotive sector. Currently India's national system of innovation is largely dominated by this industry (Mani, 2009). In addition, patenting by the Indian pharmaceutical companies has also gone up significantly over the years (Chaudhuri, 2007)⁴.

The increase of innovative efforts by the pharmaceutical companies seem to have contributed significantly to the rapid growth of the industry⁵. Today, the industry ranks fourth globally in terms of volume and thirteenth in terms of value. Further, while traditionally the industry used to be dominated by MNCs, currently, a number of Indian companies are dominating the market along with many of the key therapeutic segments. Some of the Indian pharmaceutical companies like Ranbaxy Industries, Dr. Reddy's Laboratories, Wockhardt, Cipla, Nicholas Piramal and Lupin have created a strong presence even in developed markets such as the US and Europe.

However, when these innovative activities are considered vis-à-vis other technology strategies, it is observed that expenditure on technology purchase, especially from foreign sources, has also increased along with in-house R&D, while the rate of increase in R&D intensity is only marginally higher than that for foreign technology purchase intensity between 2001 and 2008 (Table 1). When the negative rate of growth of technology purchase intensity during 1996-2000 is

³For a review on the determinants of R&D, see Pradhan (2003), Bhattacharya and Bloch (2004).

⁴However, the growth in R&D by the larger firms is expected to be greater than that for the industry as a whole as the larger firms have the necessary resources to invest in R&D.

⁵The other factors contributing to this rapid growth of the industry may include low cost advantage and availability of skilled manpower.

Technology Strategy		AVG	сѵ	TGR (%) (1996-2000)	TGR (%) (2001-2008)	TGR % (1996-2008)
	Domestic	0.09	0.41	3.75	-4.06	-9.07
Technology Purchase Intensity	Foreign	1.21	0.38	-21.81	14.67	5.65
Furchase intensity	Total	1.31	0.34	-18.48	13.61	4.60
In-house R&D Intensity		2.96	0.58	2.26	15.35	14.75

Note: AVG – Average, CV – Coefficient of Variation, TGR – Trend Growth Rate

Source: Prowess Database, CMIE.

Table 1: Alternative Technology Strategies of Pharmaceutical Companies

	20	000-01	2	004-05	2007-08		
R&D Intensity (%)	No. of Firms	Share in Total (%)	No. of Firms	Share in Total (%)	No. of Firms	Share in Total (%)	
RI = 0	169	64.0	181	60.1	120	56.6	
0 < RI < 1	40	15.2	33	11.0	22	10.4	
1 < RI < 2	17	6.4	32	10.6	15	7.1	
2 < RI < 5	21	8.0	22	7.3	20	9.4	
5 < RI < 10	11	4.2	13	4.3	17	8.0	
≥ 10	6	2.3	20	6.6	18	8.5	
	264	100.0	301	100.0	212	100.0	

Source: Prowess Database, CMIE.

Table 2

considered, the acceleration appears to be even much higher in the case of technology purchase. In addition, fluctuation in in-house R&D intensity is also much higher as compared to that of technology purchase intensity, indicating lack of consistency in R&D efforts by firms.

Besides, the distribution of firms has considerably shifted towards higher R&D intensity between 2000 and 2001 and 2007 and 2008 (Table 2). This means that the proportion of firms spending a larger part of their sales on R&D has increased over the years. Yet more than half of the firms still don't spend at all on innovation and around two-thirds spend even less than 2 percent of their sales for this purpose. This means that greater innovative efforts following amendments to the Indian Patent Act are not widespread across firms in the Indian pharmaceutical Industry.

When viewed at the firm level, we find that many of the market leaders like Sun Pharmaceuticals, Dr. Reddy's Laboratories, Ranbaxy, Wockhardt spend a considerable portion of their sales on innovation and their R&D intensity has increased over the years (Table 3). At the same time, some of the leading firms like Glaxosmithkline Pharmaceuticals, and Novartis India spend only a very small part of their sales on R&D. In other words, the R&D intensity of the firms does not show any significant increase across firms in the new IPR regime. The R&D intensity of some firms such as Ajanta Pharmaceuticals, Piramal Healthcare, and Abbott India has also fluctuated over the years.

Thus, although it increased considerably in recent years, the R&D intensity of Indian pharmaceutical firms has fluctuated considerably both at the industry and firm levels. Further, the acceleration is confined largely to a set of leading firms in the industry and more than half of the firms rely completely on technology sourcing from outside to enhance their competitive strength. This is clearly evident from the fact that technology purchase intensity, especially from foreign sources, has increased considerably during the present decade⁶.

This means that the new TRIPS-compliant product patent regime in India may not be the primary incentive to invest in in-house R&D⁷. Instead, the increasing R&D efforts in the industry may be contributing to the anticipated shrinkage of domestic opportunities due to the existing product patent regime in developed countries well before TRIPS (Chaudhuri, 2007). Many of the leading firms in the industry have used the routes of mergers and acquisitions (M&A) to strengthen their R&D

⁶However, in some cases, the rapid increase in technology purchase intensity may be due to complementarities with indigenous technology. ⁷Strong patent protection has traditionally been seen as unnecessary until relatively late in a country's development process. Developing countries are net users, not net developers of R&D intensive products (Siebeck, 1990).

		R&D Intensity (%)	l.
Company	2000-01	2004-05	2007-08
Sun Pharmaceutical Industries Ltd.	4.47	11.11	31.07
Dr. Reddy's Laboratories Ltd.	4.22	18.32	14.31
Wockhardt Ltd.	9.46	10.14	16.13
Ajanta Pharmaceuticals Ltd.	22.41	0.42	10.77
Ranbaxy Laboratories Ltd.	4.89	12.28	14.88
Torrent Pharmaceuticals Ltd.	5.72	13.08	11.79
Cadila Healthcare Ltd.	8.67	10.94	9.58
Venus Remedies Ltd.	4.02	10.77	12.38
Glenmark Pharmaceuticals Ltd.	12.67	9.09	4.70
Lupin Ltd.	5.49	7.28	8.64
Piramal Healthcare Ltd.	2.33	12.48	2.32
Cipla Ltd.	3.91	4.23	6.68
Abbott India Ltd.	0.97	9.69	3.20
Aurobindo Pharmaceuticals Ltd.	1.04	4.78	5.06
Novartis India Ltd.	3.12	1.23	1.00
Glaxosmithkline Pharmaceuticals Ltd.	0.70	0.53	0.36

Source: Prowess Database, CMIE.

Table 3: Innovative Efforts of the Leading Pharmaceutical Companies

base (Mishra, 2006). In addition, strategic alliances or tieups, and foreign direction investment (FDI) in the industry are also likely to provide the firms access to better technology and thereby to restrict the firms from investing in in-house R&D. A deeper understanding of the firms' response in the new patent regime, therefore, requires identification of the factors that influence their R&D efforts. The next Section of the paper is an attempt in this direction.

3. Determinants of R&D Efforts

3.1. Specification of Functional Relationship

The factors that determine the R&D efforts by the pharmaceutical firms can be identified by using the structure-conduct-performance (SCP) framework based on the early work of Edward Mason (1939) and developed further by Bain (1959)⁸. While the traditional SCP paradigm

postulates a unidirectional relationship from structure to conduct and from conduct to performance, successive developments in the industrial organization literature suggest multidimensional causal relationships amongst market structure, firms' conduct, their performances and policies of the government⁹. Considering that in-house R&D is an important instance of firm conduct, we hypothesize that R&D efforts by a firm (R&D) depend on market conditions (MST), and conduct other than R&D (FCN) and performance (PER), i.e.,

$$R \& D = f(MST, FCN, PER)$$
(1)

Let us include market demand (MSZ) and market share (SHARE) as proxies for market conditions, mergers and acquisitions (M&A), capital intensity (KI), selling efforts (SELL), exports intensity (EXP), imports intensity of finished products (IMP) and foreign technology purchase intensity (FTPI) for firms' conduct other than R&D, and profitability (PROF) and firm-level risks (FR) for firms' performance. The above functional relationship can, therefore, be rewritten as:

$$R \& D = f(MSZ, SHARE, M \& A, KI, FTPI, SELL, \\ EXP, IMP, PROF, FR)$$

(2)

⁸The original SCP framework is criticised on the grounds that the analyses are purely empirical in nature and they lack rigorous foundation in economic theory (Davies et al., 1989). Besides, the model is too deterministic to understand the functioning of imperfect markets (Scherer and Ross, 1990). However, the extensive application of the framework to different industries under various economic environments and apparent success of the approach has led to a more robust theory of industrial organisation.

⁹See, Scherer and Ross (1990) for the details in this regard.

As the influence of M&A, FTPI, SELL, PROF and FR on R&D may not be instantaneous and many of these independent variables like FTPI, PROF, SELL may be influenced by R&D as well, following (Kambhampati, 1996) we introduce a one-year lag in these variables to capture the dynamics of adjustments as well as to control for the problem of endogeneity¹⁰. Hence, we rewrite (2) as the following:

$$R \& D_{it} = f(MSZ_{it}, SHARE_{it}, M \& A_{i,t-1}, KI_{it}, FTPI_{i,t-1}, SELL_{i,t-1}, EXP_{it}, IMP_{it}, PROF_{i,t-1}, FR_{i,t-1})$$
(3)

It should be mentioned that there is no consensus on the measurement of firms' innovative efforts in the literature. A number of indices, such as expenditure on R&D, number of persons engaged in R&D activities, number of invention patents received, extent of significant innovation pioneered, estimates of sales associated with new products, etc. are used in the existing studies for measuring firms' innovation efforts (Bhattacharya and Bloch, 2004). The choice of measure depends largely on convenience and the logical judgment of the researchers¹¹. However, as data on R&D expenditure are easily available at the firm level, in the present paper, we use R&D intensity, i.e., the ratio of R&D expenditure to sales as a measure of firms' R&D efforts.

3.2. Probable Impact of the Explanatory Variables

MSZ: The larger a market a firm has the greater its willingness and ability to spend more on innovation. It also encourages the entry of new firms and the consequent competitive pressure forces the existing firms to enhance their efficiency and competitiveness through R&D. Having a larger market may also induce a firm to create a strategic entry barrier through R&D. In other words, a larger market is expected to result in greater R&D efforts.

SHARE: A large number of studies (e.g. Scherer, 1967; Gilbert and Newbery, 1982) suggest that dominant firms tend to have greater R&D efforts. Firms with higher market share are likely to have greater ability and willingness to spend for innovation due to their 'deep

pockets' and expected higher market power. However, the larger market share of a firm can also make it complacent and hence reduce its urge to innovate. The nature of relationship between market share and R&D intensity of a firm, therefore, depends on which of these processes dominates empirically.

M&A: It is observed that the foreign affiliates spend significantly less on R&D than their domestic counterparts in the Indian manufacturing sector (Kumar, 1987; Kumar and Saqib, 1996; Kumar and Agarwal, 2000) as they have access to the R&D base of the parent companies. When a domestic firm is acquired by or merged with a foreign affiliate, it gets easy access to better technology and R&D base. This is likely to reduce the in-house R&D efforts of the domestic firm. On the other hand, if M&A by domestic firms raise their market power, R&D efforts may increase. Further, some of the M&A in the industry were guided by the motive of strengthening R&D bases (Mishra, 2006). Thus, the nature of the impact of M&A on the R&D efforts of a firm depends on the relative strength of these diverse forces.

KI: A firm with high capital intensity deters entry and, therefore, reduces possible competitive threat. This may encourage the firm towards in-house R&D. However, when a firm sources technologies in embodied form (e.g., machines, tools, equipments, etc.) the necessity of inhouse R&D efforts declines. Thus, the nature of the impact of KI on the R&D efforts of a firm depends on the relative strength of these diverse forces.

FTPI: A number of studies have examined the relationship between technology imports and R&D expenditure (e.g., Katrak, 1991; Siddharthan and Krishna, 1994; Basant, 1997) and it is often found to be a complex one (Kumar, 1987). Many of the firms source technologies in disembodied form from abroad due to their limited capabilities towards the development of indigenous technologies. In such cases, the purchase of foreign technology is a substitute for R&D activity in the receiving firms. On the other hand, if in-house R&D is adaptive in nature, a complementary relationship can be postulated. The exact nature of the relationship between R&D and FTPI, therefore, depends on the requirement of the firms and the nature of R&D.

SELL: Production differentiation and the creation of entry barriers through advertising are treated as strategic alternatives to innovation by firms. Further, in the absence of in-house R&D, creation of marketing and distribution related complementary assets can also provide adequate competitive advantage to the firms.

¹⁰The R&D behaviour of firms is a complex phenomenon and the lines of causation often run from supposed determinants to R&D and from R&D to its supposed determinants (Pradhan, 2003). For example, while foreign technology purchase may depend on initial indigenous technological capabilities (Katrak, 1997), high profit margin may itself be an outcome of successful R&D activities (Kumar and Saqib, 1996).

¹¹For the details on problems of measuring innovation, see Kuznets (1962).

Therefore, the firms that spend more on advertising, marketing and distribution, may be expected to spend less on in-house R&D.

EXP: Survival in the international market requires greater competitiveness, especially, in terms of offering new quality products at lower prices vis-à-vis competitors. Greater penetration in the international market can also raise the ability of firms to spend on innovation. Hence, the firms with greater outward orientation through exports are likely to spend more on innovation (Braga and Willmore, 1991; Kumar and Saqib, 1996; Kumar and Agarwal, 2000).

IMP: Assuming that imported drugs and pharmaceutical products are of better quality, one may expect that the firms with higher import intensity to have greater dominance over the market at a quicker interval. When this is the case, greater import intensity may reduce the R&D efforts of the firms concerned. However, greater import competition may also force the firms to be more innovative (Bhattacharya and Bloch, 2004).

PROF: Firms with better financial performance are expected to have greater ability as well as willingness to spend on innovation (Branch, 1974; Grabowski, 1986; Audretsch, 1995). It is also possible that firms with better financial performance may become complacent and reduce their emphasis on innovation. On the other hand, firms with low profitability may be under pressure to be innovative to become more competitive (Horowitz, 1961; Braga and Willmore, 1991). The impact of profitability on R&D intensity, therefore, depends on which of the diverse forces dominates.

FR: High firm-level risks, conventionally measured in terms of the variability in the firm's performance over time, may compel a firm to make R&D efforts to stabilize its performance, especially when the variability is due to increasing inter-firm competition. High firm-level risks may also make in-house R&D a risky proposition and hence force the firm to rely on technology sourcing and other strategic alternatives to enhance competitiveness.

3.3. Methodology and Data

The above regression equation is estimated by applying panel data estimation techniques for a set of 52 listed drugs and pharmaceutical companies over the period between 2000 to 2001 and 2007 to 2008. Use of panel data helps in raising the sample size and hence the degrees of freedom considerably. It also incorporates the dynamics of firms' behavior in the marketplace. This is very important in having a better understanding of the factors that influence firms' R&D decisions. Necessary data are collected from the PROWESS database of the Centre for Monitoring the Indian Economy (CMIE), Mumbai. Here, all the variables are measured as simple three years' averages from the year under reference to make the data set more consistent over time. Further, such measures of the variables along with a one-year lag in the functional model take care of the adjustment process for the variables and eliminate the problem of simultaneity. Details on the measurement of the independent variables are given in Appendix I.

We estimate the random effects model (REM). The choice of REM over the fixed effects model (FEM) is based on the assumption made on the intercept. It is assumed that the intercept is a random variable with a common population mean and the firm specific intercept differs from the population mean by the error term. This is so because the sample firms in the present paper are drawn from a very large population¹² and, therefore, the individual effect is likely to be random¹³. Further, each of the firms in the industry may have a large number of decisional/strategic options. Therefore, even when we control for the determinants of a firm's R&D decisions, this may not be exhaustive,¹⁴ causing firm specific intercepts to be random. Hence, the above functional relationship can be rewritten as the following:

$$R \& D_{it} = \alpha_{1i} + \alpha_2 MSZ_{it} + \alpha_3 SHARE_{it} + \alpha_4 M \& A_{i,t-1} + \alpha_5 KI_i + \alpha_6 FTPI_{i,t-1} + \alpha_7 SELL_{i,t-1} + \alpha_8 EXP_i + \alpha_9 IMP_i + \alpha_{10} PROF_{i,t-1} + \alpha_{11} FR_{i,t-1} + u_{it}$$
(4)

Here, $\alpha_{1i} = \alpha_1 + \varepsilon_i$

(5)

This means that the intercept is a random variable with a common mean α_1 and the firm specific intercept differs from the population mean by the error term ε_i . As

 $^{^{12}}$ By large population we refer not only to infinite individual units but also to the infinite number of decisions that each firm may take.

¹³ In the present paper, we consider a set of 52 pharmaceutical firms, which is only a small part of the much universe of the Indian pharmaceutical industry.

¹⁴ In fact, R&D decisions may be influenced by a large number of other factors in addition to those considered in the present model. This may include cost of innovation, uncertainty in innovation outcome, experience of the firm in in-house R&D, nature and structure of its ownership, etc. However, due to lack of systemic data, the present paper fails to capture this aspect.

mentioned above, the rationale behind such assumption is that when 'n' cross sectional units are drawn from a relatively large population, the individual effect is characterized as random and inference pertains to the population from which the sample is drawn. This causes heterogeneities in firm-specific intercepts that are reflected in the error term ε_i . Substituting (5) in (4) we get,

$$R \& D_{it} = \alpha_{1} + \alpha_{2}MSZ_{it} + \alpha_{3}SHARE_{it} + + \alpha_{4}M \& A_{i,t-1} + \alpha_{5}KI_{i} + \alpha_{6}FTPI_{i,t-1} + + \alpha_{7}SELL_{i,t-1} + \alpha_{8}EXP_{i} + \alpha_{9}IMP_{i} + + \alpha_{10}PROF_{i,t-1} + \alpha_{11}FR_{i,t-1} + \omega_{it}$$
(6)

Here,
$$\omega_{it} = \varepsilon_i + u_{it}$$
 (7)

In other words, the composite error term of equation (6) consists of cross-section specific error (ε_i) as well as the combined time-series and cross-section error component (u_{it}). It is assumed that the errors follow normal distribution with zero mean and constant variance, i.e., $\varepsilon_i \sim N(0, \sigma^2_{\varepsilon})$ and $u_{it} \sim N(0, \sigma^2_u)$. It is also assumed that the individual error components are not correlated with each other and are not autocorrelated across both cross-section and time-series units, i.e., $E(\varepsilon_i u_{it}) = E(\varepsilon_i \varepsilon_j) = 0(i \neq j)$ and

 $E(u_{it}u_{is}) = E(u_{it}u_{jt}) = E(u_{it}u_{js}) = 0 (i \neq j; t \neq s).$

Therefore, $E(\omega_{it}) = 0$ and $Var(\omega_{it}) = \sigma^2 \varepsilon + \sigma^2 u$. This makes the composite error terms of a given crosssectional unit at two different time points correlated¹⁵ and for any given cross sectional unit the value of this correlation coefficient remains the same even if the two time points are distinctly away from each other. Further, the correlation coefficient also remains the same for all the individual units. When it is so, estimation of equation (7) by the method of ordinary least squares will result in inefficient estimators. So, following Gujarati and Sangeetha (2007), in the present paper, equation (7) is estimated by applying the method of feasible generalized least squares (FGLS)¹⁶.

time point t and s,
$$corr(\omega_{it}, \omega_{is}) = \frac{\sigma^2_{\varepsilon}}{\sigma^2_{\varepsilon} + \sigma^2_{u}} (t \neq s).$$

There are two distinct advantages of applying REM over FEM. First, while the observed characteristics that remain constant for each individual are dropped in FEM, they are retained in REM. Second, unlike the FEM, the REM does not lose degrees of freedom to estimate cross-sectional intercepts. The assumption of randomness vis-à-vis pooled regression is confirmed by using the Breusch and Pagan (1980) Lagrange Multiplier test. The Breusch-Pagan Lagrange Multiplier Test examines the validity of the REM on the basis of the null hypothesis that the variance of the random disturbance term is zero, i.e., $H_o: \sigma_u^2 = 0$ against the alternative hypothesis that the variance of the random disturbance term is different from zero, i.e., $H_1: \sigma_u^2 \neq 0$

The test uses the following test-statistic that follows $\chi^{\rm 2}$ distribution:

$$LM = \frac{nT}{2(n-1)} \left[\frac{\sum n\overline{\varepsilon_t}^2}{\sum \sum \varepsilon_{it}^2} - 1 \right]^2 \sim \chi^2(1)$$

Here, T is number of time periods; n number of groups of states. If the computed χ^2 is less than the critical value, i.e., if the null hypothesis is not rejected, the pooled regression model is appropriate. When the computed χ^2 that exceeds the critical value, we reject the null hypothesis in favor of the REM and confirm random effects in the relationships.

3.4. Results and Discussions

The summary statistics of the variables used in the regression model are presented in Table 4. The regression results of the pooled regression model and the REM are given in Table 5. It is observed that the F-statistic in the pooled regression model and the Wald χ^2 statistic in the REM are statistically significant. Further, the value of R² is also quite high in both models. This means that both the estimated models are statistically significant with high explanatory power. However, as the Breusch-Pagan χ^2 is statically significant, the REM is preferred to the pooled regression model. Accordingly, the regression results of the REM are used to discuss the individual coefficients.

It is observed that the coefficients of MSZ, SHARE, KI, SELL, PBIT, EXP and IMP are statistically significant. While MSZ, EXP, KI and PBIT have significant positive impact on R&D intensity, SHARE, SELL and IMP have significant negative impact on the same. This means that the firms with higher demand in the domestic market or greater penetration in the international market, greater capital

¹⁵The correlation coefficient of the composite error term for firms *i* at

¹⁶In FGLS, first the method of OLS is used to derive an estimator of the covariance matrix of the error term and then this covariance structure is used to estimate the coefficients.

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
RD	260	3.06	5.05	0.00	37.82
MSZ	260	4.38	2.35	-1.92	8.06
SHARE	260	1.92	2.94	Neg.	16.20
MA	260	0.78	1.25	0.00	7.00
KI	260	1.67	3.05	0.26	28.21
FTPI	260	0.15	0.97	0.00	13.27
SELL	260	14.71	32.75	0.00	354.48
EXP	260	21.54	25.62	0.00	123.97
IMP	260	20.86	47.96	0.00	457.78
PBIT	260	30.36	103.58	-166.53	1212.57
FR	260	16.60	66.47	0.06	737.42

Note: Neg. –Negligible (< 0.005).

Table 4: Summary Statistics of the Variables used in the Regression Model

intensity or better financial performance have higher R&D intensity. Larger presence in the domestic or international market¹⁷ or better financial performance boosts a firm's innovation intensity. Better financial performance also raises a firm's ability for R&D, whereas higher capital intensity encourages a firm towards innovation by creating an entry barrier.

On the other hand, firms with greater share in the domestic market or with greater selling efforts or higher import intensity spend less on in-house R&D. In other words, Indian pharmaceutical companies use product differentiation through advertising, creation of marketing and distribution of related complementary assets and import of drugs and pharmaceutical products¹⁸ as alternative strategies to innovation. Besides, a relatively strong position in the market makes a firm complacent and reduces its innovative efforts. This is contradictory to the findings of a large number of studies (e.g. Scherer, 1967; Gilbert and Newbery, 1982) which suggest that dominant firms tend to have greater R&D efforts.

Interestingly, the coefficients of M&A, FTPI and FR are not statistically significant. This means that mergers and acquisitions or foreign technology purchase or variations in firms' profitability do not have significant impact on the R&D efforts of Indian pharmaceutical companies. There are three interesting aspects to these findings. First, no statistically significant impact of FTPI on R&D intensity suggests that foreign technologies are neither substitutes nor complements of in-house innovation in the Indian pharmaceutical industry. This is contradictory to the findings of many of the earlier studies (e.g., Lall, 1983; Katrak, 1990; Basant, 1997; Kumar and Agarwal, 2000) that indicate a complementary relationship between imports of foreign technology and R&D activity of domestic firms in Indian manufacturing.

Second, more number of M&A by a firm neither increases its R&D intensity nor reduces the same. Increase in market power though M&A may encourage a firm towards innovation, but if it has easy access to better technology of the participating firm(s), R&D efforts may not be enhanced. The observation of no statistically significant impact of M&A on R&D intensity, therefore, suggests that while many of the Indian firms use the route of M&A to strengthen their R&D base (Mishra, 2006), others largely rely on the R&D base of their foreign affiliates. One may expect M&A to increase market power of the domestic firms and hence their R&D efforts. However, this possibility is ruled out in the present context as market share has an inverse relationship to R&D intensity.

Third, Indian pharmaceutical firms make decisions on spending for R&D on the basis of the level of profitability not on the basis of its variability. The observation of a positive relationship between profitability and R&D intensity is consistent with the findings of Branch (1974), Grabowski (1986), and Audretsch (1995). However, the firms with greater fluctuations in their profitability do not use innovation as a route to stabilize financial performance nor do they reduce R&D efforts to avoid

¹⁷A positive coefficient of exports intensity is consistent with the findings of Braga and Willmore (1991), Kumar and Saqib (1996), Kumar and Agarwal (2000), Bhattacharya and Bloch (2004).

¹⁸A negative coefficient of import intensity is contradictory to the findings of Bhattacharya and Bloch (2004). This may be due to greater dominance by the firms over the market in a quicker interval though imports of quality drugs and pharmaceutical products and hence lower intention to innovate.

	Pooled Regression		Random Effects Model			
Variable	Coefficient	t-Statistic	Variable	Coefficient	z-Statistic	
Intercept	-3.069	-3.74*	Intercept	-3.658	-3.88*	
MSZ	0.624	3.70*	MSZ	0.956	3.88*	
SHARE	0.214	1.30	SHARE	-0.499	-2.05**	
M&A	0.924	2.88*	M&A	0.064	0.28	
КІ	0.972	2.56**	КІ	0.670	2.55**	
FTPI	-0.112	-0.80	FTPI	-0.001	-0.01	
SELL	-0.047	-2.18**	SELL	-0.043	-1.90***	
EXP	0.058	3.67*	EXP	0.131	4.37*	
IMP	-0.007	-2.57**	IMP	-0.015	-3.17*	
PROF	0.011	1.65	PROF	0.014	2.16**	
FR	-0.006	-0.80	FR	0.002	0.38	
F-Statistic	156.73*		Wald χ^2	4284.4*		
R ²	0.64		R ² - Within	0.68		
No. of observations	260		R ² - Between	0.41		
			R ² - Overall	0.45		
			Breusch Pagan χ^2	205.59		
			No. of Observations	260		

Note: *statistically significant at 1 percent **statistically significant at 5 percent

*** statistically significant at 10 percent

Table 5: Regression Results

risks. In other words, regulating the market forces to stabilize firms' performance may not necessarily enhance their innovative efforts as R&D itself is a risky proposition. Rather, under risky business conditions the firms may use alternative strategic options to improve their financial performance.

4. Concluding Remarks

In the context of recent amendments to the Indian Patent Act and introduction of product patent, the present paper attempts to examine the innovative efforts of Indian pharmaceutical companies in the new patent regime. The paper finds that although R&D intensity has increased significantly in the current decade, the increasing R&D efforts are not widespread across the firms and more than half of the Indian pharmaceutical companies do not spend at all on R&D. This means that protection of intellectual property alone is not enough to encourage the firms towards innovation. An investigation into the determinant of innovative efforts suggests that, R&D intensity of the firms depends directly on their market size, capital intensity, exports orientation and past profitability, but inversely on their market share, selling efforts and import intensity. However, a firm's involvement in mergers and acquisition or sourcing of technology from foreign sources or variability in financial performance does not have any significant impact on its R&D efforts.

The findings of the present paper have three important policy implications. First, as R&D efforts of the firms decline with increase in market share, it is necessary to control for the emergence of monopoly power in the market. Increasing market share and hence control over the market makes a firm complacent towards innovation. This means that inducing greater competition in the market is very important to induce the firms towards inhouse R&D. It should be ensured that the incumbents don't create strategic barriers through their selling efforts to restrict entry of new firms and thereby to protect their market power. The competition authority should play a proactive role in this regard, particularly in controlling restrictive and unfair business practices by the incumbents. Second, greater penetration in the exports market encourages a firm towards innovation. This is very important for the firm to face the threat of international competition and survive in the global market in the long run. Hence, trade policies should be directed towards greater exports by the pharmaceutical firms. This requires the removal/relaxation of the restrictions on exports of pharmaceutical products and an appropriate incentive structure that can encourage the firms to penetrate in the international market in a bigger way. However, it should be ensured that greater exports don't limit the availability of essential drugs and other pharmaceutical products and increase their prices in the domestic market.

Third, the approach towards imports requires serious scrutiny. The policies relating to imports should provide easy access to necessary machinery and equipment. This is very important as easy access to such machinery and equipmens and hence greater capital base for a firm can have significant positive influence on its R&D efforts. Further, easy imports of final drugs not only discourage firms from innovating, but also raise dependence on foreign firms for many life-saving medicines and hence may go against the interest of the common mass. It is, therefore, necessary to create an appropriate incentive/disincentive structure that discourages imports and motivates the firms to invest in the innovation of these important drugs. 🖪

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Appendix I: Measurement of the Variables

As mentioned earlier, all the variables are measured as simple three year averages from the year under reference to make the data set more consistent over time, along with taking care of the adjustment process and eliminating the problem of simultaneity amongst the variables.

RD: The ratio of research and development related expenditure (R) by a firm to its sales (S) is used as a measure of

research and development intensity (RD) of that firm, i.e.,
$$RD_{it} = \frac{\frac{RE_{it}}{S_{it}} + \frac{RE_{i,t-1}}{S_{i,t-1}} + \frac{RE_{i,t-2}}{S_{i,t-2}}}{3}$$

MSZ: The variable market size (MSZ) of a firm is measured as,

$$MSZ_{it} = \frac{\ln(S_{it}) + \ln(S_{i,t-1}) + \ln(S_{i,t-2})}{3}$$

where, S_{it} stands for sales of firm i in year t.

SHARE: Market share of a firm (SHARE) is measured by using the following formula:

$$SHARE_{it} = \frac{\frac{S_{it}}{\sum_{i=1}^{n} S_{it}} + \frac{S_{i,t-1}}{\sum_{i=1}^{n} S_{i,t-1}} + \frac{S_{i,t-2}}{\sum_{i=1}^{n} S_{i,t-2}}}{3}$$

Here, S_{it} stands for sales of firm i in year t and n for total number of firms in the industry.

MA: The total number of deals during last three years is considered as a measure of mergers and acquisitions (MA) in year t, i.e.,

$$MA_{it} = MA_{it} + MA_{i,t-1} + MA_{i,t-2}$$

KI: The ratio of capital employed (CE) by a firm to its sales (S) is used as a measure of its capital intensity (KI), i.e.,

$$KI_{it} = \frac{\frac{CE_{it}}{S_{it}} + \frac{CE_{i,t-1}}{S_{i,t-1}} + \frac{CE_{i,t-2}}{S_{i,t-2}}}{3}$$

SELL: Selling intensity (SELL) of a firm is measured by using the following formula:

$$SELL_{it} = \frac{\frac{SE_{it}}{S_{it}} + \frac{SE_{i,t-1}}{S_{i,t-1}} + \frac{SE_{i,t-2}}{S_{i,t-2}}}{3}$$

Here, SE_{it} and S_{it} stand for total selling expenses (i.e., the sum of advertising, marketing and distribution related expenses) and sales respectively of firm i in year t.

FTP: The present paper uses the ratio of expenditure for foreign technology (FT) by a firm to its sales (S) as a measure of foreign technology purchase intensity (FTP) of that firm, i.e.,

$$FTP_{it} = \frac{\frac{FT_{it}}{S_{it}} + \frac{FT_{i,t-1}}{S_{i,t-1}} + \frac{FT_{i,t-2}}{S_{i,t-2}}}{3}$$

EXP: We measure exports intensity (EXP) of a firm by using the following formula:

$$EXP_{it} = \frac{\frac{EX_{it}}{S_{it}} + \frac{EX_{i,t-1}}{S_{i,t-1}} + \frac{EX_{i,t-2}}{S_{i,t-2}}}{3}$$

Here, EX_{it} and S_{it} stand for exports and sales respectively of firm i in year t.

IMP: Imports intensity (IMP) of a firm is measured by using the following formula:

$$IMP_{it} = \frac{\frac{IM_{it}}{S_{it}} + \frac{IM_{i,t-1}}{S_{i,t-1}} + \frac{IM_{i,t-2}}{S_{i,t-2}}}{3}$$

Here, IM_{it} and S_{it} stand for imports and sales respectively of firm i in year t.

PROF: The ratio of profit before interest and tax (PBIT) to sales (S) is used as the first measure of profitability (PROF1), i.e.

$$PROF_{it} = \frac{\frac{PBIT_{it}}{S_{it}} + \frac{PBIT_{i,t-1}}{S_{i,t-1}} + \frac{PBIT_{i,t-2}}{S_{i,t-2}}}{3}$$

FR: The present paper uses variability of profitability of a firm as a measure of its risks of operation over last three years, i.e.,

$$FR_{it} = \sigma\left(\frac{PBIT_{it}}{S_{it}}, \frac{PBIT_{i,t-1}}{S_{i,t-1}}, \frac{PBIT_{i,t-2}}{S_{i,t-2}}\right)$$

Does Cooperation Pay? The Role of Social Capital among Household Plot Farmers in Ukraine

Axel Wolz, Jana Fritzsch, Gertrud Buchenrieder, Andriy Nedoborovskyy*

Abstract:

Social capital matters, not the least in determining individual welfare. It is argued that it functions similar to traditional production factors. However, there are not many empirical analyses about this issue at the farm-household level in general and in post-communist countries in particular. Whether or not social capital affects farm income is tested using micro-data from 255 household plot farmers in Ukraine. The data reflect 23 social capital indicators. These are merged in four separate index variables. The index variables reflect the theoretical dimensions of social capital, namely form, i.e. structural and cognitive, and relationship, i.e. bonding and bridging. By adopting multiple regression analysis, it can be shown that social capital in the form of bridging is indeed a significant factor for determining the level of agricultural income. However, the findings also underline the multidimensional side of social capital. Both bonding and cognitive social capital show no immediate impact on agricultural income among household plot farmers in Ukraine.

Keywords: empirical survey, household farming, agricultural income, social capital, Ukraine

JEL: 013, P32, Q12, Z13

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1. Introduction

In general, the transition of the agricultural sector from a centrally planned to a market economy has not been as successful as originally anticipated in most countries of Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS). A number of reasons have been given, which can be summarised as follows (ROZELLE and SWINNEN 2004; BEZEMER 2002): underdeveloped rural financial systems and complicated modes of farm restructuring led to limited access to loans owing to a lack of profitability, collateral problems, risks and uncertainty. Similarly, the farm sector was characterised by a weak human capital structure, fragmented land ownership, rapid changes in agricultural policies and an incomplete legal framework (for a summary of the impediments and achievements of transformation in the agri-food sector see BUCHENRIEDER et al. 2009). In this respect, the risk-averse behaviour of economic agents like farmers was seen as guite rational. As an additional reason, it has been argued that the poor and disappointing results of the transformation process

* Axel Wolz

Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO) E-mail: wolz@iamo.de

Jana Fritzsch

Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO)

Gertrud Buchenrieder

Martin Luther University Halle-Wittenberg

Andriy Nedoborovskyy

Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO)

	Corporate farms	Peasant farms	Household plots
Number of units	17,700	43,000	~ 5,500,000
Share of agricultural land (%) ^{a)}	58.7	8.2	33.1
Average size (hectares)	1384.0	80.0	2.5
Share of gross agricultural output (%) ^{b)}	35.8	3.9	60.3

Source: LERMAN et al. 2007, pp. 1-2, 21, 29

Note: a) Total area: 42 million hectares

b) At 2000 prices

 Table 1:
 Distribution of total farm number, size and production in Ukraine (2004)

have been due to a low level of social capital (e.g. PALDAM and SVENDSEN 2000).

Over the last few years, the number of studies of the role of social capital in CEE and CIS has increased. For example, a very comprehensive overview of research on social capital in CEE has been presented by MIHAYLOVA (2004). However, while the number of studies about the impact of social capital on rural development is rising, there are just a few focusing on the agricultural sector. Researchers are just starting to look in more detail into the concept of social capital and its relevance for agricultural development. Among others, CHLOUPKOVA and BJORNKOV (2002), HUDECKOVA and LOSTAK (2003) and WOLZ et al. (2006a) analysed data from the Czech Republic; FORGACS (2008) from Hungary, WOLZ et al. (2006b) from Poland, LERMAN and MIRZAKHANIAN (2001) and KASARJYAN (2010) from Armenia. All these studies confirm that social capital in one form or the other is significant in increasing agricultural income.

Up to the break-up of the Soviet Union and its independence, agricultural production in Ukraine was characterised by state (sovkhoz) and collective farms (kolkhoz). The subsequent reform process has been lengthy and in many ways a difficult process. The first round of reform in 1992-93 initiated privatisation of land through the distribution of paper shares to the rural population and mandated the transformation of former state and collective farms into shareholder structures. The second round of reforms started in late 1999 when corporate farms were obliged to convert their paper shares into fully titled land plots. Hence, nearly seven million rural residents became owners of physical land plots (LERMAN et al. 2007). Following these two rounds of reform the agricultural sector a dual land tenure structure emerged. On the one hand, about 17,700 large-scale corporate farms cultivate, on average, about 1,400 ha per farm, and on the other hand, about 5.5 million (more subsistence oriented) household farmers cultivate, on average, about 2.5 ha per household (Table 1). Inbetween there is a relatively small group of about 43,000 peasant farmers. Subsequently, it can be stated safely that agricultural production is still dominated by so-called household plot farmers. They provide about 60 percent of the total gross agricultural output. Business-oriented farms play a minor role.

The main reason for the strong role of household plot farms seems to be the necessity of securing the family's food consumption.¹ Moreover, surplus production forms an important source of income and helps to improve standard of living. While LERMAN et al. (2007) described these farms as semi-commercial, one could also call them semi-subsistence farms. Obviously, household plot farmers do not form a homogeneous group. Some seem to be more economically successful than others. In general, a varying adoption of production factors, i.e. land, labour and capital is identified in economics as being of influence. Additional factors might be the level of human capital, particularly age and educational level. However, it has been observed that similar endowments of production factors do not necessarily lead to similar economic results (see e.g. SLANGEN et al. 2004; LEE et al. 2005). Therefore, we argue that there is an additional, so far under-rated factor of production, which significantly affects agricultural income among household plot farmers in Ukraine. We will test this hypothesis in making use of farm survey data from 255 household plot farmers in Ukraine, and which had been gathered in autumn 2006. With this paper we intend to contribute to the clarification of the concept of social capital in agricultural development.

Our contribution is structured as follows: in the beginning we discuss the concept of social capital, its dimensions and definition. The major part of the study

¹ DAVIDOVA et al. (2010) convincingly showed for several countries in CEE (Bulgaria, Hungary, Poland, Romania, and Slovenia) that non-marketed farm production (in other words subsistence income) lifts semisubsistence farmers above the national poverty line. They found that, on the one hand, subsistence income is substantial, amounting to 58.5 percent of household income, and that subsistence income, on the other hand, is more important for households that are below the poverty line. Especially in Bulgaria and Poland, subsistence income shifts a large share of the farming population from poor to non-poor.

will be made up by an analysis of the empirical farm survey data investigating whether social capital has an influence on their material welfare. A short concluding section follows.

2. Concept of Social Capital

The concept of social capital, although adopted rather recently in social and economic sciences, has become very popular. In broad terms, it can be defined as networks, norms and trust which facilitate information sharing, collective decision-making and collective action. Its usefulness has been derived from the observation that social networks are vital in managing one's daily life. These networks, however, are not naturally given. Investments in the institutionalisation of group relations are necessary. The group relation might then be usable as a source for other benefits (PORTES 1998). But researchers disagree, among other things, whether it should be attributed to the individual (e.g. BOURDIEU 1983) or considered group property (e.g. COLEMAN 1988; PUTNAM 1993) aggravating commonly accepted theory building. Another problem of the concept is the understanding that social capital cannot be measured directly by a few indicators, but requires multiple proxies. Hence, despite the immense amount of topical research, there is no common consensus about its meaning. In their review article, DURLAUF and FAFCHAMPS (2005, p. 1642) complain that "the success of social capital as a federating concept may result from the fact that no social science has managed to impose a definition of the term that captures what different researchers mean by it within a discipline, let alone across fields". Therefore, there has been a lot of criticism about its explanatory power in analysis, particularly among economists (e.g. MANSKI 2000). However, during the last years and following other sciences, economists increasingly recognise that people act within social and cultural contexts. These contexts affect how resources are allocated to competing ends. There has been an expanding scholarly literature describing how social capital increases an individual's ability and willingness to cooperate, improves monitoring and enforcement of contracts, and reduces free-riding and information asymmetry lowering transaction costs (FIDRMUC and GERXHANI 2008). In short, social capital matters for economic growth (ISHAM et al. 2002; BUCHENRIEDER and DUFHUES 2006) and "guestions surrounding social capital are hardly trivial for economists" anymore (GOETZ and RUPASINGHA 2006, p. 1304).

Therefore, the major challenge has been to develop a 'lean and mean conceptualisation' when applying the concept (WOOLCOCK 2002) or to follow a 'narrow focus' (DURLAUF and FAFCHAMPS 2005). One promising option is to focus on its sources. Like capital in general, social capital represents a stock of assets that yields a flow of benefits, like e.g. income streams. We follow this approach by referring to SPORLEDER and WU (2007, p. 3) who define social capital as "the sum of the actual and potential resources embedded within or available through a network of relationships that is possessed by an individual or a firm". To improve the operationalisation of social capital, GROOTAERT and VAN BASTELAER (2002) propose to focus on its dimensions. Basically, three major dimensions can be distinguished: They are (1) its scope (or unit of observation), (2) its forms (or manifestations) and (3) its type of relationship through which social capital affects development:

- With respect to *scope*, the micro, meso and macro levels of analysis can be distinguished. At the micro level individuals and households are the focus of analysis, at the meso level relations among groups rather than individuals, while at the macro level the most institutionalised relationships and structures, such as e.g. the rule of law, are analysed.
- With respect to forms two types can be distinguished: structural and cognitive. Structural social capital facilitates information sharing and collective action through established roles and social networks supplemented by rules, procedures and precedents. It is relatively objective and observable. Cognitive social capital refers to shared norms, values, trust, attitudes and beliefs. It is more subjective and intangible. It is a matter of how people think and feel. The former type facilitates a stream of benefits, in particular in lowering transaction costs, having already established patterns of interaction that make productive outcomes from cooperation more predictable and beneficial. The latter type predisposes people toward cooperative behaviour, in part because once they are widely shared they make cooperation more likely (UPHOFF 1999).
- With respect to *relationship*, again two major types can be distinguished. One type refers to intra-group relationships, i.e. relationships of 'bonding' that strengthen links between people and facilitate intragroup interaction and collective action. It brings

people who already know each other even closer together. The other type refers to inter-group relationships, i.e. relationships of 'bridging' that strengthen linkages between people, groups and organisations from different backgrounds, both at horizontal and vertical levels. It brings together people or groups who previously did not know each other. PUTNAM (2000) argues that both types of links bring benefits, but in different ways. Bonding social capital is good for promoting special reciprocity and mobilising solidarity. It is essential to enable individuals to 'get by', although it might also have negative effects. Bridging networks are better for linkage to external assets and for information diffusion. More scattered and wide-ranging bridging levels are needed to 'get ahead'.

Intuitively, all dimensions are essential for improving a person's well-being. In our analysis, we will adopt a 'narrow focus' and concentrate on the micro level, i.e. individuals of farm households. The two other dimensions, i.e. the structural and cognitive side, as well as bonding and bridging ties, are considered in as far as they are helpful in better interpreting the micro results. In this way we aim to pursue two objectives; on the one side, most facets of social capital will be covered; on the other, the number of relevant indicators to be analysed is supposed to be limited as much as possible. development in transition economies. The central hypothesis is that, besides the classical production factors, social capital can be identified as a significant factor influencing the level of farm income. We test this hypothesis by analysing primary data from a farm household survey in Ukraine that was carried out with the support of the Agricultural University in Zhytomyr in autumn 2006. The survey area is located in the Zhytomyr Region. A random sample of 255 household plot farmers was interviewed in the years 2000, 2002 and 2004 with regard to their farm management activities. In the fourth round of surveys in 2006 a questionnaire module concerning social capital was added. Thus, the data of 2006 are analysed here.

The questionnaire module on social capital covers the whole range of social capital issues at the household level with respect to its form, i.e. structural and cognitive, and its type of relationship, i.e. bonding and bridging. In total, eleven independent variables could be identified which are hypothesised to have an influence on the agricultural income of the household plot farmers (as the dependent variable). Four of them represent social capital and are derived from 23 indicators. The other seven variables represent other production factors. The data analysis starts with descriptive statistics to give an overview of the sample. Multiple regression analysis is then applied to test whether the four social capital variables have a significant impact on the annual agricultural income. All calculations were done with the software package SPSS.

3. Methodology

In this contribution, we want to analyse whether and in which way social capital impacts socio-economic

Variable	Unit	Ν	Min	Мах	Median
Independent variables:					
Labour input: total annual working time	Hours	255	730	12,159	3,600
Total arable land	Hectare	255	0.06	13.42	0.42
Number of cattle, incl. milking cows	Heads	255	0	5	2
Number of pigs and sows	Heads	255	0	11	1
Production structure ¹⁾	%	255	5	80	21
Age of household head	Years	255	20	78	48
Educational level of household head ²⁾	Scale	255	0	5	2
Bonding cognitive social capital ³⁾	Scale	255	0.29	1.00	0.76
Bridging cognitive social capital ³⁾	Scale	255	0.00	0.71	0.24
Bonding structural social capital ³⁾	Scale	247	0.09	1.00	0.73
Bridging structural social capital ³⁾	Scale	255	0.33	1.00	0.67
Dependent variable:					
Gross agricultural value added	1,000 UAH	255	-1,959	44,988	8,093

Source: Own calculation with data from IAMO Ukraine farm survey in 2006 referring to year 2005

Notes: ¹⁾ Share of crop production in total gross agricultural value added ²⁾ 0: not completed primary school, 1: primary school, 2: secondary school, 3: vocational training, 4: B.Sc., 5: M.Sc. ³⁾ Index ranging from 0.0 to 1.0.

Table 2: Descriptive statistics for the variables in the model

3.1. Descriptive Statistics

The eleven independent variables were condensed to six categories (i.e. labour, land, capital, production structure, human capital and social capital). These variables were used in the quantitative analysis below. Gross agricultural value, which was added in 2005 as an indicator for agricultural income, represents the dependent variable. It was calculated as total value of agricultural production minus variable production costs. On average, it stood at about 8,093 UAH (1 EUR = 7.24 UAH; OANDA 2008) in 2005. The variables in the model are described in Table 2.

Labour. The labour input is measured as the sum of the total working time of all household members. The total median labour input comes out to about 3,600 hours per farm.

Land. This indicator covers the total size of arable land operated by the farm, including land for annual crops, fruits and vegetables. The median farm size is 0.42 ha. Compared to the national average, our sample is focused on smaller household plot farms.

Capital. Unfortunately, respondents were not in a position to come up with reliable estimates of the value of their buildings, tools and livestock. Therefore, two proxy indicators were asked as almost all household plot farmers keep animals; first the number of cattle including cows and, second, the number of pigs including sows. The respective median numbers stand at 2 and 1 heads.

Production structure. In our model, we apply production structure as an additional independent variable, which can be understood as a rough proxy of the farming system. It reflects the most important farm activities and determines agricultural income to a large extent. In general, it is used as an approach for analysing the decisions of agricultural producers and their linkages to other stakeholders (DOPPLER 2000). In our analysis this variable presents the share of crop production in total agricultural production. On average, about 21 percent of the gross value added is made up by the value of crops. LERMAN et al. (2007) report a more even balance of crop and livestock production among household plot farmers in Ukraine. This relative small share of crop production in our sample might reflect the fact that the average farm size is relatively small.

Human capital. Two variables reflect the human capital of the household plot farmers. First, the age of the household head was recorded. With an average age of 48 years, the figure is rather low. Therefore, household plot

farmers cannot be equated with retired persons. In addition, the sample was asked about the educational level of the household heads. This variable is measured on a scale ranging from zero (not completed primary school) up to five (completed M.Sc.). The median value comes up to two (completed secondary school).

Social capital. In total, the questionnaire covered 38 different aspects of social capital. Out of these, 23 indicators could be applied for further analysis. Interestingly, almost no household plot farmer is a member of a formal self-help organisation, e.g. service cooperatives or lobbying organisations. Therefore, the respective indicators had to be dropped from further analysis. One option generally applied when analysing a large set of variables is the creation of a single numerical index (e.g. see for social capital analyses: NARAYAN and PRITCHETT 1999; KRISHNA and UPHOFF 2002). The problem with this approach is that it requires strong and somewhat arbitrary assumptions about the weights for each indicator in the aggregation. In addition, this method assumes that a single numerical index is sufficient to represent social capital. However, various studies have shown that social capital is not a homogeneous entity (WINTERS et al. 2002).

Therefore, in line with the theoretical discussion about the heterogeneity and various dimensions of social capital we deduced four index variables out of the 23 indicators. In our analysis, each indicator has equal weight in the respective index variable. The four index variables were calculated by adding the figures for the single indicators belonging to that respective index and dividing the sum by the highest possible sum of answers. This procedure results in values between zero and one. Zero stands for no social capital at all with respect to that index variable, while a higher value implies greater social capital. The four index variables look as follows:

(1) The index bonding cognitive social capital comprises six core indicators: The first three summarise trust to close family members, neighbours and friends, respectively. A four-stage scale of answers was given: no trust, to a little extent, to a great extent and full trust. In addition, the respondents were asked whether they thought that they could borrow money (i.e., about one week's spending) from neighbours, friends and/or family members living outside of the household. We asked about their assessment and not whether it really happened before. The answers were rated along a five-stage scale: definitely no, probably no, unsure, probably yes and definitely yes. With respect to trust, respondents



Trust to ...

Possibility to borrow money from ...



Source: Own calculation with data from IAMO Ukraine farm survey in 2006

Figure 1: Distribution of the six indicators that form the variable bonding cognitive social capital (percent of households in the respective categories)





Possibility to borrow money from ...

Source: Own calculation with data from IAMO Ukraine farm survey in 2006

Figure 2: Distribution of the six indicators that form the variable bridging cognitive social capital (percent of households in the respective categories)

trust mostly their fellow family members and with a certain gap, their friends. Trust in neighbours is not very strong. More than ten percent of the respondents do not trust their neighbours at all. The majority of respondents were quite confident that they could borrow money in case of need from close family members, but also from neighbours and friends (Figure 1).

(2) The index bridging cognitive social capital comprises again six core indicators. The first three refer to trusting in local government officials, input suppliers and traders (buyers of agricultural products), respectively. In addition, farmers were asked about their opinions on whether they could get a loan (i.e. again the amount of about one week's spending) from a corporate farm nearby, a bank and/or a credit union. Again, the answers reflected their opinions. The respective answer categories are the same as for bonding cognitive social capital. The findings show that the respondents had almost no trust at all in input suppliers and traders. Trust in government officials is a bit higher, but there is also not a great deal of

confidence in them (Figure 2). The option of getting even a small loan from a formal source was seen as rather slim. Just about a quarter of the respondents assessed that they would get a loan from the local corporate farm or a local bank (Figure 2).

(3) The index *bonding structural social capital* is made up of five core indicators. First, farmers were asked about the option of getting help from neighbours. Five answer categories were possible: never, rarely, sometimes, most of the time and always. More than a third responded that they were getting help sometimes and most of the time, respectively (Figure 3). A second question asked farmers about their relations to fellow household plot farmers in their respective villages. Again, five answer categories were given: hostile, bad, medium, good and excellent. There seems to be strong common threads among household plot farmers. More than two thirds of the respondents described their relations as good, another 20 percent as excellent (Figure 3). The final three questions relate to cooperation with neighbours,



Getting help from neighbours

Relations to fellow household plot farmers



Source: Own calculation with data from IAMO Ukraine farm survey in 2006

Figure 3: Distribution of the two indicators that are part of the variable bonding structural social capital (percent of households in the respective categories)



Personal relations to...

Source: Own calculation with data from IAMO Ukraine farm survey in 2006

Figure 4: Distribution of the five indicators that form the variable bridging structural social capital (percent of households in the

voluntary work for the community and the attendance of village festivals during the previous year. All these three questions had a binary answer category. Respondents could reply either yes or no. The level of togetherness is quite high, amounting to more than 80 percent for all three categories.

(4) Finally, the index *bridging structural social capital* combines six core indicators. The first five indicators concern the personal assessment of their relations, as an indicator of informal networks, to managers of the corporate farm nearby, input suppliers, traders (buyers of

agricultural products), food processors and local authorities, respectively. A five-stage scale of answer categories was given: no, bad, loose, good and strong relations. The respondents assessed their personal relations as good (more than half for each group), particularly to local authorities and managers of corporate farms (Figure 4). This reflects a certain dichotomy: while household plot farmers do not trust input suppliers, traders and government officials as stated above, they generally assess their personal relations as good. In addition, respondents were asked whether they

	Model w	ith all variables	Model with significant variables only*		
Variable (i)	b(i)**	Level of significance***	b(i)**	Level of significance***	
Labour	-0.021	0.548			
Land	0.210	0.000	0.204	0.000	
Number of cattle	0.593	0.000	0.590	0.000	
Number of pigs	0.462	0.000	0.451	0.000	
Production structure	0.082	0.025	0.079	0.029	
Age of household head	0.021	0.542			
Educational level of household head	-0.048	0.161			
Bonding cognitive social capital	-0.019	0.606			
Bridging cognitive social capital	0.005	0.900			
Bonding structural social capital	0.014	0.693			
Bridging structural social capital	0.075	0.053	0.070	0.030	
Constant		0.120		0.012	
Corrected R ²		0.739	0.742		

Does Cooperation Pay? The Role of Social Capital among Household Plot Farmers in Ukraine

Source: Own calculation with data from IAMO Ukraine farm survey in 2006 (N = 255)

Note: * When a model includes irrelevant variables then the estimators for the coefficients are unbiased but inefficient (MADDALA 1992). Therefore, the original model was stepwise backwards reduced till it only included significant variables. ** Standardised coefficients, ***A significance level lower than 0.1 indicates a significant effect of the variable on gross agricultural value added.

Table 3: Results of multiple regression analysis

or another household member are members of a political party. A binary answer category was given, i.e. either yes or no. About a quarter of all households comprised at least one member who had joined a political party.

3.2. Multiple Regression Analysis

In order to test our hypothesis that social capital enhances the level of gross agricultural value added we calculated the following multiple regression model (equation 1). The regression coefficients are calculated by the ordinary least squares method and tested for significance.

(1) <i>GAVA</i>	$= const + \sum_{i=1}^{11} b(i) * variable(i)$
GAVA	: gross agricultural value added
Const	: regression's constant
b(i)	: coefficient for the i th variable, i=111
variable(i)	: value for the i th variable, i=111

The variance inflation factors (VIF) were smaller than 2.0 and the pairwise correlations were smaller than 0.8 for all variables, indicating that there is no multicollinearity between the variables in the models (HÜBLER 1989). Among the total number of observations (N = 255) there were eight with missing values. These had been replaced by the median value of that respective variable. Table 3

summarises the results of the multiple regression analysis showing the variable coefficients and their significance level. On the left-hand side, the influence of all eleven variables is reproduced, while on the right-hand side, only the significant explanatory variables are shown. Six out of the eleven variables were not significant in the first model. Just the variables 'land', 'number of cattle', 'number of pigs', 'production structure' and 'bridging structural social capital' were significant. On the other side, the variables labour, the two human capital variables and the other three social capital variables were not significant. At this stage, our hypothesis was confirmed by the analysis, as one facet of social capital was significant.

In the following, the model was reduced in a stepwise modus to a model comprising significant variables only, i.e. the calculation started with the full model which was backwards reduced such that non-significant variables were excluded step by step from the model. According to AGRESTI (2002) this is the most preferable procedure of statisticians. A variable was treated as non-significant if its level of significance was higher than 0.1. Finally, only significant variables were left in the model. Both models are highly significant and explain more than 70 percent of the observed variability in gross agricultural value added.

In the final model, five variables remain, which have a significant impact (at the 5 percent-level) on gross agricultural value added. They are 'land', the two proxy

variables for capital, i.e. 'number of cattle', 'number of pigs', 'production structure' and 'bridging structural social capital'. The coefficients of all five variables are positive, indicating that an increasing endowment with land, capital and bridging structural social capital increases gross agricultural value added among household plot farmers in Ukraine. The absolute values of the coefficients demonstrate that capital and land have the strongest effect on agricultural income followed by the production structure and social capital. This result is concordant with neoclassical economic theory. In addition, our hypothesis is confirmed that social capital in the form of its bridging structural type has a significant positive impact on agricultural income. This supports the thesis that links connecting people from different backgrounds are important to "get ahead". In the Ukrainian background these are mostly informal links as membership in formal organisations among these farmers is negligible.

However, all the other types of social capital do not show any significant impact. In this respect, we suggest that various facets of social capital do not run in the same direction but might even oppose each other. We conclude that bonding and cognitive social capital do not promote agricultural income. In fact, the coefficient of bonding cognitive social capital is negative, although not significant, implying that strong ties among close kin might even hamper economic development as suggested, among others, by SABATINI (2008) making use of data on Italy. In addition, we were surprised that two production factors, i.e. labour and human capital, did not show any significant impact on agricultural income. We suggest that farm size is the constraining factor for Ukrainian household plot farmers. Because the farms are very small, an additional unit of labour input or higher education do not have an income effect. This situation is also described in the development literature in the context of hidden unemployment. In addition, higher educated household members might be more engaged in non-farm activities.

4. Conclusions

Household plot farmers are the dominant group among agricultural producers in Ukraine, yet they do not form a homogenous group. Some households are economically more successful than others. Varying access to classical production factors (land, labour, capital and human capital) does not seem to account solely for this variation. Therefore, it is hypothesised that social capital also contributes to the difference. However, there are hardly any studies on the impact of social capital on agricultural sector development and adjustment in Ukraine. In analysing empirical data from a survey among 255 household plot farmers in 2006, the aim was to fill this gap. Gross agricultural value added as an indicator for agricultural income is taken as a dependent variable. It is regressed against the classical production factors as well as a bundle of four social capital index variables. These indices represent various dimensions of social capital, i.e. with respect to its forms: structural and cognitive, and with respect to its relationships: bonding and bridging.

The econometric analysis revealed five significant variables: land, number of cattle and the number of pigs (both indicators for capital), production structure and bridging structural social capital. The other production factors were not significant. With respect to our hypothesis, the findings show that social capital in its bridging structural form, in addition to the classical production factors, has a significant impact. Hence, our hypothesis has been supported. In the Ukrainian context these are mostly informal links.

However, the other three index variables reflecting social capital were not significant. The various indices do not seem to run in the same direction. We conclude that both bonding and cognitive social capital do not promote agricultural income among household plot farmers in Ukraine. Actually, strong ties with close kin might even hamper economic development. The results indicate that social capital is not homogenous and only certain dimensions of it are valuable in promoting economic development. In this respect, our findings confirm the multidimensional and context-dependent nature of social capital (SABATINI 2008). One initial recommendation can be drawn: Household plot farmers can improve their agricultural income if they build up and strengthen links and networks with people from different backgrounds. In this respect, they might need active support from outside. This, however, does not mean that development of social capital is a panacea for the economic ills among household plot farmers in Ukraine. However, it can be identified as one factor which has a significant influence on their material well-being.

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Work Alienation as a Mediator of the Relationship of Procedural Injustice to Job Stress

Adnan Ceylan, Seyfettin Sulu*

Abstract:

Procedural justice, which refers to the perceived fairness of decision-making procedures, is accepted as an important antecedent of several job attitudes and behaviors such as turnover intention, organizational commitment, trust, and stress in organizational justice literature.

This study examined the relationship of procedural injustice to job stress, and whether work alienation, which has not been referred to in justice literature before, serves as a mediator in this relationship. Two dimensions of work alienation (powerlessness and social isolation) were addressed for this study. It was hypothesized that procedural injustice causes job stress, and work alienation serves as a mediator in this relationship. These relationships were tested in a sample of 383 health care professionals (doctors and nurses) from public and private hospitals in Istanbul. The results revealed that procedural injustice was associated with job stress and each of the work alienation dimensions partially mediated this relationship. The theoretical and practical implications of this results are discussed below.

Keywords: Procedural Injustice, Job Stress, Powerlessness, Social Isolation, Work Alienation

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1. Introduction

Researchers who have studied procedural justice claim that it affects several employee work attitudes and behaviors, such as job satisfaction, turnover intention, absenteeism, stress, organizational commitment, and trust (Dailey and Kirk 1992; Boer et al. 2002; Vermunt and Steensma 2003; Greenberg 2004; Hubbel and Chory-Assad 2005). In recent years, the health care industry has become a focus of research, especially in the context of hospital-based care. Therefore, many studies have examined the influence of organizational justice on the attitudes and behaviors of hospital employees. Among health care professionals, nurses appear to be the most discussed group by several researchers in organizational justice. Posthuma, Maertz, and Dworkin (2007) state that multiple dimensions of procedural justice were effective on the turnover behavior of nurses in the context of workscheduling. Another study showed that procedural injustice was a significant predictor of destructive behavioral intentions among maternity nurses (leaving the organization, reporting sick, coming late etc.) (VanYperen et al. 2000). Greenberg (2006) examined insomnia as a reaction to a particular work-related stressor among 467 nurses working at 4 hospitals. He found that a change in pay policy led workers to

* Adnan Ceylan

Department of Business Administration Gebze Institute of High Technology (GYTE), Turkey E-mail: aceylan@gyte.edu.tr

Seyfettin Sulu

Department of Business Administration Gebze Institute of High Technology (GYTE), Turkey E-mail: seyfettinsulu@hotmail.com experience stress, and that insomnia was significantly greater among nurses whose pay was reduced. In Leiter and Maslach's (2009) study, workload, control, reward, community, fairness, and values were defined as the six key areas of worklife predictive of burnout which they defined as a prolonged response to chronic interpersonal stressors on the job.

Research on work alienation has also focused on its nature and predicting its antedecents and consequences, such as isolation in organizations, organizational leadership, organizational citizenship behavior, organizational commitment, work experience and drinking behavior (Miller 1975; Sarros et al. 2002; Banai and Reisel 2007; Mendoza and Lara 2007; Banai, Reisel, and Probst 2004; Yang, Yang, and Kawachi 2001). However, no study could be found that referred to the relationship between procedural justice and work alienation.

This study takes into account the perceived procedural injustice of health care professionals, and examines whether it has an effect on job stress, and whether work alienation mediates this relationship. Health care professionals were chosen for this study for several reasons. First, health care is one of Turkey's most important industries, and has been rapidly growing in recent years. This rapid growth has brought several complaints, especially as work outcomes (pay, bonus etc.) have begun to rise among health care professionals. Second, procedural justice may be an effective organizational justice dimension to prevent these complaints. Third, procedural injustice leads to lack of control, and may cause escapist coping (e.g. turnover) to alter this source of stress. Consequently, losing these highly technically skilled health care professionals may prove costly for a hospital.

2. Literature Review

2.1. Procedural Injustice

Individuals are not only interested in the outcomes they receive in organizations but also consider the allocation processes (decisions) important as well. The judgment process related to allocation decisions is termed procedural justice (Krehbiel and Cropanzano 2000). Procedural justice refers to how an allocation decision is made (Konovsky 2000). It is the perceived fairness of procedures which are the means used to determine outcomes (Greenberg 1990; Konovsky 2000; Folger and Konovsky 1989; Ambrose, Seabright, and Schminke 2002; Lam, Shaubroeck, and Aryee 2002; Robbins, Summers, and Miller 2000). Any violation by a decision-maker or an organization can arouse perceptions of procedural injustice (Kickul, Gundry, and Posig 2005). According to the control model, procedural justice provides employees with indirect influence over the outcome of the decision-making process by means of process control. Process control, which has also been called voice in justice literature, refers to an employee's possibility to express his/her views during the decisionmaking process (Elovainio et al. 2004). Procedural justice contains the structural features of a decision making process, such as the amount of employee voice (Cropanzano, Prehar, and Chen 2002). Employees prefer procedures which allow them to control input into decision-making processes to gain favorable or desired personal outcomes (Konovsky 2000). When procedures give them the opportunity of control they perceive the processes and decisions as more fair (Elovainio et al. 2004; Alder and Ambrose 2005).

Decision-making procedures allow voice and help employees to control and influence material outcomes (Konovsky 2000; Price et al. 2006). Such control can produce more favorable outcomes (Greenberg 1990). If a distribution of outcomes or a process satisfies certain criteria, employees believe that it is fair, and consequently, that these fair procedures lead to fair distributions (Boer et al. 2002; Hegtvedt, Clay-Warner, and Johnson 2003). Fair processes facilitate the acceptance of outcomes even when these are undesirable (Greenberg 2001). Furthermore, fair treatment reduces some of the uncertainty experienced in working life, and helps employees to predict and control future events more easily (Colquitt et al. 2006). Before a decision is made the concerns of all affected subgroups and individuals should be considered carefully (Kickul, Gundry, and Posig 2005; Schmitt and Dörfel 1999). Allocation processes and procedures should be representative of all affected employees' views, opinions, needs, and values in the process (Judge and Colquitt 2004; Cohen-Charash and Spector 2001). Posthuma, Maertz, and Dworkin (2007) stated that the information used in a decision by management should fairly represent the views of all affected employees. The procedure must guarantee that all affected parties have an opportunity to state their views and concerns (Nowakowski and Conlon 2005).

Another explanation is offered in the group value model that voice increases feelings of inclusion, respect,

and standing within a group (Price et al. 2006). The group value model examines procedures in terms of their relational aspect. Fair procedures construct employees identities based on the group to which they belong. Fairness in a group communicates to employees that the group values them (Blader and Tyler 2003). Being treated by important group members in a fair manner leads to positive feelings such as feeling respected and being proud to be a member of the group (Elovainio et al. 2005).

2.2. Job Stress

Stress is a result of adverse work experiences such as uncertainty or lack of control. These work experiences that cause stress are often referred to as stressors (Judge and Colquitt 2004). Organizational injustice is a type of job stressor which affects psychological, physical, and behavioral reactions (Elovainio et al. 2004). When people are treated unfairly they may experience stress. For example, when an employee discovers that a new employee is being paid more than him/her this situation may cause him/her to experience stress (Greenberg 2004). Employees accept procedural injustice as a stressor, which produces psychological distress (Tepper 2001). Unfair outcomes will be accepted as more fair when allocation procedures are seen as fair. Allowing voice in a decision making process related to allocations increases employees' perceived fairness of the outcome decision, and decreases stress (Vermunt and Steensma 2003).

In a stressful work environment excessive demands are made of the individual. The individual lacks the abilities or is not fully equipped to cope with a stressful situation (Jamal 2005). Uncertainty and lack of control form the basis of the stress construct, and procedural justice allows for long-term outcomes to be controlled and predicted more easily (Judge and Colquitt 2004). As a result of an unfair procedure, an employee may likely think that he/she is unable to predict and control future events and in turn, experiences stress. According to Elovainio et al. (2005) control refers to having power or mastery in an environment and may reduce stress situations. To be able to control a potentially threatening situation helps individuals to predict the result and reduce uncertainty.

Perceived procedural injustice will cause employees to think that they lack the opportunity to control decision making procedures. Consequently, this lack of control and uncertainty related with the result of decision making procedures will cause employees to experience stress.

2.3. Work Alienation

When an employee is not able to express him/ herself at work due to a loss of control over the product and process of his or her labor, work alienation occurs (Mendoza and Lara 2007). As a result of the absence of autonomy and control in the workplace, workers may experience alienation. If the work environment cannot satisfy the needs of individual autonomy, responsibility, and achievement of the workers, it will create a state of alienation (Kanungo 1983). When a person is treated exclusively, differently or unfairly because of his or her group membership he or she often feels alienated and angry (Enshner, Grant-Vallone, and Donaldson 2001). Organizations in which there is a lack of autonomy for employees in the selection of tasks and that do not allow enough participation in decision making are likely to cause a high degree of work alienation. There iss an inverse relationship between alienation from work and participation in decision making. In one case of low participation in decision making, trainees from a management training program experienced work alienation (Allen and LaFollette 1977).

Alienation at the workplace means that employees may not be able to fulfill their social needs (Nasurdin, Ramayah, and Kumaresan 2005). Alienation decreases the motivation of workers, psychologically separates them from work and acts to reduce work involvement. Alienated workers are unable to satisfy their salient needs and expectations from work (Banai, Reisel, and Probst 2004) and form a gap between perceptions of an objective work situation and their personal interests such as values, ideals, and desires (Mendoza and Lara 2007). They view their jobs instrumentally, avoid autonomy, responsibility, and higher status, and engage in nonwork pursuits. They do not care personally for participation in work processes - their goal is solely to earn money (Shepard 1970).

As can be seen, these expressions of discontent are similar to those of the control model and the group value model. If employees are treated unfairly within group relations or deprived of voice in processes they are likely to experience alienation. We proposed that two dimensions of work alienation (powerlessness and social isolation) are related to organizational justice, and examined this relationship in this study.

Powerlessness is the absence of control over events in a person's life (Banai and Reisel 2007) and the inability for employees to control their work processes at the workplace (Yang, Yang, and Kawachi 2001; Bacharach and Aiken 1979). In an alienated work environment, workers neither control the work process nor participate in organizational decision-making. Generally, powerlessness may have two sub-dimensions: whether the workers are free of action in the work process, or have influence on organizational decision-making (Bacharach and Aiken 1979). The sense of powerlessness is a stable individual response to the various social contexts a person is involved in (Heinz 1991). Alienated workers perceive that control is lacking over the pace and method of the work and over his or her physical movements (Leiter 1985). Lack of freedom or autonomy leads to powerlessness (Ambrose, Seabright, and Schminke 2002), leaving employees unable to exert control over work activities, and as a result suffer a lack of job autonomy (Mendoza and Lara 2007).

According to the cognitive appraisal Model, when someone has been harmed by an event (for example, an unfair disbribution), he/she assesses whether he/she can avoid or minimize the harm. Not to be able to deflect the harm may cause feelings of powerlessness (Greenberg 2004). People who are not allowed voice and/or decision control may perceive future harm/loss as a threat and experience psychological distress (Tepper 2001). Low procedural justice may cause employees to perceive little or no control, and this sense of powerlessness can prevent him/her from taking action against the source of stress (Zellars et al. 2004).

Powerlessness means that one has no influence on decisions. Nursing discourse was subordinated to managerial discourse, and nurses were relatively

powerless in relation to managers. The behavior of managers influenced this powerlessness, and this powerlessness had a mediating effect between the behavior of managers and stress (Taylor, White, and Muncer 1999). Nurses tend to avoid feelings of powerlessness because powerlessness prevents them from solving problems. Status and power help nurses to resolve or ignore conflicts with doctors (Tabak and Koprak 2007).

A socially isolated employee is not supported or helped by his or her colleagues or superiors (Yang, Yang, and Kawachi 2001). These employees do not have enough inclusion and social acceptance at the workplace (Banai and Reisel 2007) and perceive that they have a lack of integration with their coworkers, their occupation, or the organization where they work (Leiter 1985). Organizations do not equally distribute personal influence or organizational power, and do not generate equally flexible or identically rewarding interaction patterns among their members. The amount of freedom workers have to socially interact with other members affects their ability to influence the group's functioning (Miller 1975).

According to the group value model of justice an unfair procedure indicates that an individual is a low status member within the group or the relationship between group member and the authority figure is negative (Cropanzano et al. 2001). Implementation of unfair procedures, or to not apply procedures fairly and/or to exclude employees from decision making procedures may likely cause them to feel isolated. Furthermore, allocation processes and procedures which are not representative of the affected employees' views, opinions, needs, and values may likely cause feelings of isolation.



Figure 1: Proposed Model

3. Research Model and Hypotheses

In the light of these explanations, we expect that a relationship exists between perceived procedural injustice and job stress. In addition, we propose that two dimensions of work alienation (powerlessness and social isolation) have mediating roles in the relationship between procedural injustice and job stress. We present the hypotheses and proposed model below.

Hypothesis 1: Employees' perceptions of procedural injustice will be positively associated with their sense of work alienation. Specifically, employees' perceptions of procedural injustice will be associated with their sense of (a) powerlessness, and (b) social isolation.

Hypothesis 2: Employees' perceptions of procedural injustice will be positively associated with job stress.

Hypothesis 3: Work alienation will mediate the relationship between perceived procedural injustice and job stress. Specifically, (a) powerlessness and (b) social isolation will mediate the relationship between perceived procedural injustice and job stress.

4. Methodology

4.1. Procedure and Participants

Questionnaires were created on the basis of scales obtained from relevant literature, and were distributed to 700 doctors and nurses working in public and private hospitals in Istanbul via electronic mail and face to face interviews. Of the 700 distributed, 413 questionnaires were returned. Thirty questionnaires were excluded from the analysis because of missing or incorrect marking. In the end, 383 valid questionnaires were analyzed. Of the respondents, 66.8 percent were from public hospitals, and 33.2 percent were from private hospitals. In terms of profession, 69.8 percent of the sample consisted of doctors with the remaining 30.2 percent nurses.

4.2. Measures

All construct items were assessed using a five-point Likert-type scale ranging from 1=strongly disagree, and 5=strongly agree.

Procedural injustice was assessed with a 8-item scale which referred to the procedures used to arrive at outcomes. Sample items included "I am not able to

express my views and feelings during those procedures". Colquitt's (2001) original scale items were converted to negative statements in order to measure the degree of perceived injustice.

Work Alienation was measured by a total of 15-items from two distinct studies. Six items from Leiter (1985) and nine items used by Yang et al. (2001) were adopted by this study. Of the total 15 items, 4 items were removed from the scale due to the low factor loadings. The work alienation scale included the dimensions of Powerlessness and Social Isolation. Powerlessness was measured by 4 items. Sample items included "I am not allowed to express my own opinions and views on the job". The measure of social isolation included 7 items. Sample items included "I am not able to get practical help from colleagues when difficulties are encountered".

Job Stress was measued by a 5-item scale adopted from House and Rizzo (1972). Sample items included "If I had a different job, my health would probably improve".

5. Results

We conducted the principal components analysis with a varimax rotation to investigate whether the variables were distinct constructs. In order to conclude whether the amount of data was sufficient to measure our research and adequate for the factor analysis, both a "Kaiser-Meyer-Olkin (KMO) test" and "Bartlett's Test of Sphericity" were conducted. To be able to perform a factor analysis, to a certain extent there must be correlation between variables. If the result of the Barlett's test is lower than .05, there is sufficient relationship between variables to conduct a factor analysis. The KMO measure of sampling adequacy varies between 0 and 1, the minimum acceptable level is .50, and the result is considered better as this value approaches 1 (Sipahi, Yurtkoru, and Cinko 2008).

The results of Barlett's test of our study was .000 (significant at the level of p< .001), and the KMO result was .92 for the study's variables. Therefore, the result of this test indicated that our scale was sufficient to measure the variables. As expected, each of the study variables (procedural injustice, powerlessness, social isolation, and job stress) were loaded onto separate factors. Total variance was explained at .66 percent. Table 1 shows descriptive statistics, reliabilities, and pearson correlations for all variables. Croanbach alpha reliabilities for all scales shown on the diagonal in parantheses were above .70,

	Mean	SD	1	2	3	4	
1. Procedural Injustice	3.29	1	(.92)				
2. Powerlessness	2.64	.94	.480***	(.85)			
3. Social Isolation	2.72	.92	.472**	.542**	(.90)		
4. Job Stress	3.17	.98	.418**	.488**	.481**	(.85)	

**p < .01, All significance tests are two-tailed.</pre>

Croanbach alpha reliabilities for all scales shown on the diagonal in parantheses

Table 1. Descriptive Statistics, Reliabilities, and Pearson Correlations (N= 383)

	Powerlessness			So	Social Isolation			Job Stress		
Variable	β	t	р	β	t	p	β	t	р	
Procedural Injustice	.48***	10.70	.000	.47***	10.44	.000	.42***	8.98	.000	
	R	0.48		R	0.47		R	0.42		
	R ²	0.23		R ²	0.22		R ²	0.18		
	F	114.32 ***		F	109.07 ***		F	80.60 ***		

**** p < .001, All significance tests are two-tailed</p>

Table 2. Regression Results for Hypotheses 1 and 2

and were acceptable levels. We have proved that the scales we used for our research were all reliable.

Having shown that the scales were reliable and sufficient to measure our data, we may move on to the correlation analysis. As shown in Table 1, procedural injustice was positively related with work alienation dimensions. Procedural injustice was significantly and positively associated with powerlessness (r= .480), and social isolation (r= .472) at the level of .01. This means that the more employees' perceived procedural injustice the greater their sense of work alienation. These results show that employees' levels of perceived procedural injustice are a significant predictor of work alienation.

The relationship between procedural injustice and job stress was positively significant at the level .01 (r= .418). The relationships between powerlessness and job stress, and social isolation and job stress were also statistically significant (r= .488, r= .481 at the level .01, respectively).

To test Hypotheses 1 and 2, we conducted a series of regression analyses. As shown in Table 2, procedural injustice significantly predicted powerlessness (β = .48, p< .001) and social isolation (β = .47, p< .001). *Hypothesis 1 was supported*. Procedural injustice was a statistically significant predictor of work alienation. In addition, procedural injustice was also predictive of job stress (β = .42, p< .001). *Hypothesis 2 was also supported*. Employees' perceptions of procedural injustice were positively associated with job stress. Eighteen percent of the

variance in job stress was accounted for by procedural injustice.

In Hypothesis 3, it was proposed that work alienation would mediate the relationship betweeen procedural injustice and job stress. To test this relationship, a mediated regression analysis was conducted.

According to Baron and Kenny (1986) four conditions must be met for a mediation. First, the independent variable must be related to the mediator. This relationship was tested in Table 1 and 2, and found to exist. Procedural injustice affected both powerlessness and social isolation separately. Second, the independent variable must be related to the dependent variable. This result is also displayed in Tables 1 and 2. Procedural injustice was associated with job stress. For condition 3, the mediator must be related to the dependent variable. As shown in Table 1, there were relationships between each of the mediator variables (powerlessness and social isolation) and job stress. For condition 4, the previously significant relationship between the independent variable and the dependent variable must be no longer significant when the mediator is controlled. The independent variable must account for less or no variance when the mediator is included in the regression equation. If the independent variable has no significant effect after controlling for the mediator, full or perfect mediation is supported. If the effect of the independent variable is reduced but still significant when the mediator

	Job Stress							
		Step 1			Step 2			
Variable	β	t	р	β	t	р		
Procedural Injustice	.42***	8.98	.000	.24***	4.80	.000		
Powerlessness				.37***	7.54	.000		
R^2 for each step		.18			.28			
$R^2\Delta$.10			
F		80.60 ***			56.91 ***			
	β	<u>t</u>	p	β	t	p		
Procedural Injustice	.42***	8.98	.000	.25***	4.97	.000		
Social Isolation				.37***	7.39	.000		
R^2 for each step		.18			.28			
$R^2\Delta$.10			
F		80.60 ***			54.58 ***			

p < .001, All significance tests are two-tailed.

Table 3. Hierarchical Regression Results for Hypothesis 3

is controlled, partial mediation is indicated. The results of mediated regression analysis are shown in Table 3.

As shown in Table 3, the previously significant relationship between procedural injustice and job stress (β = .42, p < .001) was reduced but was still significant when the mediator (powerlessness) was entered in the regression equation (β = .24, p < .001). This result showed that a sense of powerlessness partially mediated the relationship between procedural injustice and job stress. *Hypothesis 3a was partially supported*. The previously significant relationship between procedural injustice and job stress was reduced but still significant when the mediator social isolation was entered in the regression equation (β = .25, p < .001). This result showed that a sense of social isolation partially mediated the relationship between procedural injustice and job stress.

5. Discussion

The results revealed that procedural injustice has effects on each of the work alienation dimensions and job stress. Uncertainty and lack of control are the basis of both procedural injustice and job stress. According to the control model of justice, decision-making procedures allowing employees to control (voice) the process helps

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them to control and influence material outcomes, to predict future events, and to obtain more favorable outcomes. If employees do not have the possibility of such control or voice they are unable to affect decisions, and hence experience job stress. The present results clearly indicate that procedural injustice is а significant predictor of job stress.

The link between procedural injustice and job stress was partially mediated by powerlessness and

social isolation. Control over one's job is an important aspect of feelings of powerlessness. The powerlessness dimension of work alienation indicates similar views with the control model of procedural justice. An employee who cannot reflect his/her views and opinions on procedures, and has a lack of control over processes or decisions thinks that he/she cannot affect these processes and as a result experiences a feeling of powerlessness. In addition, an employee whose concerns, views, needs, and opinions are not considered in a decision making process feels him/herself isolated. According to the group value model, an unfair procedure indicates that the individual is a low status member within the group, and unfairness in this group leads to a sense of isolation. This sense of powerlessness and isolation ultimately lead to job stress.

The findings of this study are particularly important in organizations with professional or technical-skilled employees. Dailey and Kirk (1992) state that losing successful and highly technical skilled employees may have negative consequences for an organization. Employees with these skills are in great social and material demand. Powerlessness may have possible negative consequences in the form of several job attitudes and behaviors of employees such as increased turnover, absenteeism or destructive behaviors. Ambrose, Seabright, and Schminke (2002) state that individuals who have a feeling of powerlessness may engage in destructive behaviors such as sabotage to regain control. Greenberg and Barling (1999) state that job insecurity reflects the perceived powerlessness to keep control over one's job, and is likely to result in anxiety and stress, intent to leave, and decreased job satisfaction, commitment, and trust in the company. Sense of powerlessness may cause the use of aggression to regain control. A lack of procedural justice may lead to feelings of diminished control, and this sense of powerlessness makes escapist coping the more accessible option to alter the source of stress (Zellars et al. 2004). Furthermore, doctors and nurses comprise the majority of a hospital's staff and they have high training costs. Therefore, for example, understanding which antedecents influence their turnover intentions is important for hospital supervisors (Ding and Lin 2006).

The results indicate that managers must pay attention to employees' perceptions of procedural injustice. Employees who perceive that procedures are fair will be more likely to have a sense of control and lower social isolation feelings. These results support the importance of employee participation and control in decision-making processes. Managers should allow employees to provide information to the decision maker before a decision is made (Posthuma, Maertz, and Dworking 2007). In addition, an accurate and open communication environment, and regular feedback must be provided to employees by managers. According to Leiter and Maslach (2009), control is associated with fairness and reward, and helps nurses to work according to their values and to develop a healthy, sustaining worklife. Beecroft, Dorey, and Wenten (2008) also state that allowing nurses to participate in decision-making, autonomous and empowered behavior, communication, collaboration and openness in relations with other employees increased job satisfaction, improved the quality of care, and facilitated recruitment and retention.

Empowerment may be effective in overcoming the sense of powerlessness. According to Kanungo (1992), empowerment is a de-alienating strategy in feelings of powerlessness among subordinates. Brashear, Manolis, and Brooks (2005) also state that empowerment and control allows employees to be more certain of the relationship between their efforts (inputs) and outcomes such as pay or promotion. As Beecroft, Dorey, and Wenten (2008) state, empowerment is likely to cause increased job satisfaction and organizational commitment, and empowered individuals are likely to feel more control over their work. In this respect, future studies should be conducted to find out more about the relationship between procedural injustice, work alienation and empowerment. As a result of the heavy work loads of doctors and nurses, we were unable to collect a large number of surveys. Therefore, future studies should be conducted on other work environments and/or professions.

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Financial Reforms and Industrial Sector Growth: Bound Testing Analysis for Pakistan

Shahida Wizarat, Qazi Muhammad Adnan Hye *

Abstract:

This study investigates the relationship between the financial liberalization index and industrial sector growth for Pakistan. Annual time series data from 1971 to 2007 is used and ARDL bounds testing techniques are applied. In the short run both the financial liberalization index and the real interest rate speed up industrial sector growth. However, in the long run the financial liberalization index and real interest rate slow down industrial sector growth. The error correction terms indicate that 41% disequilibrium in the short run is adjusted every year in the long run.

Keywords: Financial Liberalization, Industrial Sector Growth, ARDL Estimation Method

JEL: G32, L0, C8

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1. Introduction

In Pakistan the industrial sector contributed 26.7% to the GDP and employed almost 28% of the labor force (2007-08)¹. The industrial sector includes mining & quarrying, manufacturing, construction, electricity and gas. This sector has the requisite finance for development. In general, the financing requirements of industry fall into two types. The first is fixed capital such as the purchase of land, construction of buildings and the purchase of machinery and replacement of machinery. The second is finance required for the purchase of raw materials, payment of wages and other running expenses. However, a number of studies on the industrial sector have confirmed that banks play an important role in financial intermediation, capital formation and attracting foreign direct investment in the industrial sector [Goldberg, 2007 & Thomas, 2007]. Pakistan has taken various measures for financial reforms in order to strengthen the financial sector and to enhance the industrialization process and capital formation in the economy. The aim of this paper is to evaluate the impact of financial policy reforms on industrial sector growth in

2. Literature Review

In the theoretical literature on financial liberalization and growth three types of views are available. First, Joseph Schumpeter (1911) argued that the service

* Shahida Wizarat

Economics Department, Institute of Business Management (IoBM), Karachi, Pakistan. E-mail: shahida.wizarat@iobm.edu.pk

Qazi Muhammad Adnan Hye

Institute of Business Management (IOBM) E-mail: adnan.economist@yahoo.com

Pakistan by employing the auto regressive distributed lag model (ARDL). The remaining part of the paper is organized as follows: Section II discusses the relevant literature. Section III presents the model, data collection and the methodological framework. Section IV reports the empirical results, while section V concludes the paper.

¹ See Pakistan Economic Survey 2007-08.

provided by financial intermediaries encourages economic development through channeling society's funds to the most innovating entrepreneurs. Goldsmith (1969) defined the positive link between financial development and economic activity. Hicks (1969) stated that industrialization needs funds for long term capital investment. These funds are available through a developed financial system. That is why financial development played a critical role in industrialization in England. McKinnon and Shaw (1973) presented the concept of financial liberalization enhancing growth. Further, the New Growth theory of Romer, (1986); Barro, (1991); Japelli and Pagano, (1994) and Levine (1997) comprehensively explained that the presence of financial markets enabled securities-optimistic savers to hold such assets, making liquid funds available for long term investment. Industrialization could not occur without this liquidity transformation. According to this view, the financial system offered financial services that are crucial for economic growth. The second view states that finance is relatively less important for economic growth. Robinson (1952) argues that economic growth leads to financial development. Lewis (1955) observed that financial markets expand as a result of economic growth. Lucas (1988) stated that physical capital, human capital and technological change are the only factors influencing economic growth. According to this view the real sector increases the demand for various financial services which is met by the financial sector. This view proposes that financial development simply pursues economic growth. The third judgment departs yet further to argue that financial development could have a potential negative impact on growth. Van Wijnbergen (1982) and Buffie (1984) stated that financial developments can have no impact or indeed a negative impact on economic growth. As the formal financial system develops, funds move from the controlled market to the formal market. Due to the restraint (reserve requirement) in formal markets all the funds cannot advance. This reduces domestic credit supply, giving rise to a credit crunch, which can retard economic growth by lowering investment and slowing production. Stiglitz (1994) stated that certain forms of financial repression can have a positive effect, for example, improving the average quality of the pool of loan applicants by lowering the interest rate; increasing firm equity by lowering the price of capital and accelerating growth if credit is targeted towards profitable sectors such as exports or sectors with technological spillovers.

We now review some recent empirical literature on finance and growth. Levine et al. (2000) empirically found financial intermediation to have a positive impact on economic growth in a sample of 74 countries. La Porta et al. (2002) found that greater government ownership of banks resulted in lower per capita GDP growth, even when initial financial intermediation development had a positive and significant effect. They used data pertaining to 92 countries. Khan and Qayyum (2006) used an autoregressive distributed lag (ARDL) approach to cointegration in order to determine the long-run relationship between financial liberalization, trade openness and economic growth in the case of Pakistan. They found that trade and financial policy reforms play an important role in enhancing growth.

On the other hand some studies have found that financial liberalization impedes economic growth instead of expediting it. Demirgue-kunt et al. (2001) report that banking crises may be greater in a liberalized financial system because the banks and other intermediaries have more freedom to take risk and financial liberalization is a significant factor leading to banking sector fragility. Arphasil (2001) examined the East Asian crisis (1997-98) due to interest rates and capital account liberalization, because financial liberalization leads to a credit boom. mostly on account of short-term borrowing from abroad. Such a boom leads to an unstable foundation, ultimately creating financial fragility or crises. Wade (2001) claims that it is dangerous to liberalize capital accounts when banks have little experience of the international market and non-banking institutions also borrow abroad. It is doubly dangerous when the financial sector is based on bank borrowing rather than being equity financed and when the exchange rate is pegged. Singh et al. (2003) disagreed with the perception of donors/creditors that the fundamental causes of the Asian crisis lay in the microeconomic behavior of economic agents in these societies which was due to the Asian way of doing business. Tornell, Westermann and Martinez (2004) empirically proved that financial liberalization increased the incidence of financial crises. Mete (2007) stated that financial liberalization rendered the Turkish economy vulnerable to currency crises. Behrman et al. (2009) found that increase in financial liberalization is associated with bank crises and other domestic and external shocks, and that higher schooling inequality reduces the impetus for liberalization brought on by bank crises in Latin America.

3. Model, Data and Methodological Framework

To check the impact of financial liberalization on industrial sector growth in Pakistan, we employ a Cobb-Douglas function, as specified in equation (1) below:

$$Y_I = A L_I^{\alpha} K_I^{\beta} - - - (1)$$

Where Y_I is industrial sector GDP, A is the residual containing the impact of the real interest rate and the composite financial liberalization index (FLI), etc. L_I and K_I are respectively labor and capital in the industrial sector, and $\alpha \& \beta$ are the partial elasticities with respect to labor and capital respectively. Decomposing the residual and replacing partial elasticities by β s we rewrite equation [2] as follows:

$$Ln(Y_{I})_{t} = \beta_{0} + \beta_{1}FLI_{t} + \beta_{2}RIR_{t} + \beta_{3}Ln(L_{I})_{t} + \beta_{4}Ln(K_{I})_{t} + \mu_{1t} - - (2)$$

Where $Ln(Y_I)_t$, $Ln(L_I)_t$ and $Ln(K_I)_t$ are a natural logarithm of Gross Domestic Product, labor force and gross fixed capital formation in the industrial sector. RIR_t is the real interest rate, FLI_t is the financial liberalization index and μ_t is the error term.

3.1. Data Collection

Data on Y_I , L_I and K_I are taken from various annual publications of the State Bank of Pakistan and various issues of the Pakistan Economic Survey. Gross Domestic Product and gross fixed capital formation in the industrial sector is measured in millions of rupees and industrial labor force is measured in millions of numbers. Real interest rate is nominal deposit rate minus the inflation rate. This study uses the financial liberalization index computed by Hye and Wizarat (2010), comprising eleven financial liberalization policy components to construct the time series on financial liberalization. The liberalization policy components are Islamization; interest rate deregulation; credit controls; stock market reforms; Prudential Regulations; privatization of financial institutions; removal of entry barriers; non-performing loans; external account liberalization; debt management reforms and open market operations. The financial liberalization index demonstrates that most of the

liberalization measures were implemented by policy makers in Pakistan during the period of 1990-1996.

3.2. Methodology Framework

This paper uses Phillips and Perron's (1988) unit root test in order to determine the level of integration as it has small sample size properties (see details in Appendix-A). The Autoregressive Distributed Lag Model determines the long-run and short-run relationships between the variables, as proposed by Pesaran et al. (2001). This testing procedure is generally known as the bounds testing procedure or autoregressive distributed lag (ARDL) model. It has the following econometric advantages in comparison to other cointegration procedures. First, endogeneity problems and the inability to test hypotheses on the estimated coefficients in the long run associated with the Engle Granger method are avoided. Second, the long and short-run parameters of the model are estimated simultaneously. Third, all the variables are assumed to be endogenous. Fourth, the econometric methodology is relieved of the burden of pre-testing unit roots, and is applicable whether the underlying variables are I(0), I(1), or fractionally integrated. The ARDL procedure involves investigating the existence of a long-run relationship in the form of an unrestricted error correction model as follows:

$$\Delta Ln(Y_{I})_{t} = \beta_{0} + \\ + \beta_{1} \sum_{j=1}^{k} \Delta Ln(Y_{I})_{t-j} + \\ + \beta_{2} \sum_{j=0}^{k} \Delta FLI_{t-j} + \\ + \beta_{3} \sum_{j=0}^{k} \Delta RIR_{t-j} + \\ + \beta_{4} \sum_{j=0}^{k} \Delta Ln(K_{I})_{t-j} + \\ + \beta_{5} \sum_{j=0}^{k} \Delta Ln(L_{I})_{t-j} + \\ + \omega_{5} Ln(Y_{I})_{t-1} + \\ + \omega_{5} RIR_{t-1} + \\ + \omega_{5} Ln(L_{I})_{t-1} + \\ + \omega_{5} Ln(L_{I})_{t-1} + \\ + \omega_{1} Ln(Y_{I})_{t-1} + \\ + \omega_{5} Ln(L_{I})_{t-1} + \\ + \omega_{1} Ln(Y_{I})_{t-1} + \\ + \omega_{5} Ln(L_{I})_{t-1} + \\ + \omega_{1} Ln(Y_{I})_{t-1} + \\ + \omega_{5} Ln(Y_{I})_{t-1} + \\ + \omega_$$

The terms with summation signs in equation [3] represent error correction dynamics, while the second part (term with ϖs) corresponds to the long-run relationship. F-tests are used for testing the existence of a long-run relationship. The null hypothesis defined by $\langle H_0: \overline{\sigma}_1 = \overline{\sigma}_2 = \overline{\sigma}_3 = \overline{\sigma}_4 = \overline{\sigma}_5 = 0 \rangle$ is tested against the alternative $\langle H_0 : \varpi_1 \neq \varpi_2 \neq \varpi_3 \neq \varpi_4 \neq \varpi_5 \neq 0 \rangle$. However, the asymptotic distribution of this F-statistic is nonstandard, regardless of whether the variables are I(0) or I(1). The decision rule of a long-run relationship is as follows. If the computed F-statistic lies above the upper bound [I(1)], then the null hypothesis can be rejected at a conventional level of significance, say 1%, 5% or 10%, suggesting a co-integrating relationship among the variables. On the other hand, if the computed F-statistic lies below the lower bound [/(0)], the null hypothesis cannot be rejected, indicating no co-integration in the relationship. The critical values of the lower and upper bounds are derived from the Turner (2006) response surface, according to the sample size. However, conclusive inference cannot be made when the test statistic falls within the lower and upper bounds. In this case, the time series properties must be known before any conclusion can be drawn (Pesaran et al., 2001). When a long-run relationship exists, the F-test indicates which variable should be normalized. If a long run relationship exists (co-integration) among the variables, the following long run model is estimated:

$$Ln (Y_{I})_{t} = \beta_{0} + \sum_{j=1}^{k} \phi_{1j} Ln (Y_{I})_{t-j} + \sum_{j=0}^{k} \beta_{1j} FLI_{t-j} + \sum_{j=0}^{k} \beta_{2i} RIR_{t-j} + \sum_{j=0}^{k} \beta_{2i} RIR_{t-j} + \sum_{j=0}^{k} \beta_{3i} Ln (K_{I})_{t-j} + \sum_{j=0}^{k} \beta_{4i} Ln (L_{I})_{t=j} + \eta_{t} - - - - (4)$$

The orders of lags in the ARDL model are selected by minimizing the Schwarz Bayesian Criterion (SBC) and Akaike Information Criterion (AIC). The ARDL specification of the short-run dynamics can be derived by constructing an error correction model (ECM) of the following form:

$$\Delta Ln (Y_{I})_{t} = \beta_{0} + \\ + \sum_{j=1}^{k} \phi_{1j} \Delta Ln (Y_{I})_{t-j} + \\ + \sum_{j=0}^{k} \beta_{1j} \Delta FLI_{t-j} + \\ + \sum_{j=0}^{k} \beta_{2i} \Delta RIR_{t-j} + \\ + \sum_{j=0}^{k} \beta_{3i} \Delta Ln (K_{I})_{t-j} + \\ + \sum_{j=0}^{k} \beta_{4i} \Delta Ln (L_{I})_{t=j} + \\ + \lambda ECM_{t-1} + v_{t} - - - - (5)$$

Where, ECM_{t-1} is the error correction term and λ represents the speed of adjustment from short-run discrepancy to long-run equilibrium.

4. Empirical Results

Table-1 demonstrates the result of a unit root test: industrial sector GDP [$Ln(Y_I)$], capital in the industrial sector [$Ln(K_I)$], labor force in the industrial sector [$Ln(L_I)$], real interest rate (RIR) and financial liberalization index (FLI). The results indicate that the variables have unit root property in the level form but are stationary in the first difference form.

Regressors	Phillips Perron Unit Root Test	
	Level	1 st Difference
$Ln(Y_I)$	-2.31	-6.05*
$Ln(K_I)$	-2.42	-4.12*
$Ln(L_I)$	-1.49	-7.12*
RIR	-3.14	-5.08*
FLI	0.64	-2.37*
*: 1% Level of significance		

 Table 1: Unit Root Test Results

The next step is to compute the F-Statistic. The reported [*Table-2*] F-Statistic **[5.38]** is greater than the upper bound critical value at the 5% level of significance, indicating a stable long-run relationship among the variables.

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	F-Statistic	5.38
Critical Value	Lower Bound	Upper Bound
	I(0)	I(1)
1%	5.14	6.87
5%	3.57	4.92
10%	2.92	4.11
Critical values derived from the Turner (2006) Response		
Surface Producer. Unrestricted intercept and no trend (k=4).		
Table 2: Bounds Test for Long-Run Relationship		

Through the ARDL bounds testing procedure, the estimated long-run and short-run coefficients are presented in *Table-3 & 4* below. Interestingly, the results show that the financial liberalization index and the real interest rate are negatively (statistically significant) associated with industrial growth, while labor and capital positively affect industrial growth in the long run.

Rearessors	Dependent variable $Ln(Y_I)$	
negressors	Coefficients	t-Ratio[P- value]
FLI	-0.04	-1.87[0.07]
RIR	-0.006	-3.89[0.00]
$Ln(L_I)$	0.08	1.77[0.08]
$Ln(K_I)$	0.09	1.96[0.03]
Constant	3.55	3.01[0.00]
R-Squared	0.99	
R-Bar-Squared	0.99	
F-stat[P-value]	6537.38[0.00]	
DW-statistic	2.03	

Table-3: Long-Run Coefficients of the Industrial Growth Model

The coefficient on the financial liberalization index is - 0.04 and the coefficient on the real interest rate is -0.006, both confirming that a unit increase in the financial liberalization index and real interest rate causes industrial GDP to shrink by Rs. 1.04 million and Rs. 1.006 million respectively in the long run².

Table-4 represents the results of the ARDL based error correction model. The results indicate that financial liberalization and the real interest rate positively (at a four year lag) affect industrial growth in the short run.

D	Dependent variable $\Delta Ln(Y_{_I})$	
Regressors	Coefficients	t-Ratio[P-value]
$\Delta Ln(Y_I(-1))$	-1.003	-25.47[0.00]
$\Delta(FLI)$	0.24	17.97[0.00]
$\Delta(RIR)$	-0.003	-5.67[0.00]
$\Delta(RIR(-1))$	0.0002	3.57[0.01]
$\Delta Ln(L_I)$	-0.41	-7.62[0.00]
$\Delta Ln(K_I)$	0.61	16.92[0.00]
ECM(-1)	-0.41	-23.41[0.00]
Constant	2.14	10.84[0.00]
R-Squared	0.99	
R-Bar-Squared	0.99	
F-stat	196.03[0.00]	
DW-statistic	3.46	

Table 4: Short Run Coefficients of Industrial Growth Model

Capital positively and labor negatively impacts industrial growth in the short run. The labor coefficient is negative because in the short run output cannot increase through an increase in labor force alone. The coefficient on the error correction term indicates that a 41% shortrun disequilibrium is adjusted every year.

Test Statistics	LM Version	F Version
A: Serial Correlation	-	0.006[0.93]
B: Functional Form	-	0.13[0.71]
C: Normality	0.59[0.74]	-
D: Heteroscedasticity	-	0.83[0.36]

Table 5: Diagnostic Test Results

Table-5 represents the diagnostic tests results. The test results confirm the validity of the long-run and short-run results. The stability of the selected ARDL model has also been evaluated using the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) of the recursive residual test for structural stability. The model appears stable and correctly specified because neither the CUSUM nor the CUSUMSQ test statistics exceed the bounds of the 5 percent level of significance (see *Figures 1 & 2*).

5. Conclusion and Policy Recommendations

The purpose of this study is to investigate the impact of financial reforms on industrial sector growth in the case of Pakistan by applying the semi-log function for the period 1971-2007. The empirical results indicate that the financial liberalization index and the real interest rate are negatively (statistically significant) associated with industrial growth, while labor and capital are positively

 $^{^2}$ The antilog of the financial liberalization index and real interest rate coefficients are 1.04 and 1.006 respectively.
Plot of Cumulative Sum of Recursive Residuals



Figure 1: Cumulative Sum (CUSUM)



Figure 2: Cumulative Sum of Squares (CUSUMSQ)

associated with economic growth in accordance with the postulates of growth theory. In the short run the financial liberalization index and the real interest rate both show a robustly positive (statistically significant) relationship with economic growth. The empirical results indicate that financial liberalization impedes economic growth in the long run. The study recommends that Pakistan's policy makers revise financial liberalization to address its adverse impact on industrial sector growth.

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Challenges To Sustainable Development In Island Tourism

Marinela Krstinić Nižić, Saša Ivanović, Danijel Drpić *

Abstract:

Every participant in the life of a local community, hence the local community of the island of Krk as well, must develop an awareness of how they can cooperate in the improvement of quality, environmental protection and safety. This awareness can be achieved through constant education, and the improvement and perfection of all the destination factors for the island of Krk. With the preventive measures of environmental protection and optimal resources usage in the construction projects and management of the island of Krk, as well as waste management practices (the system known as "The Eco Island of Krk"), the island of Krk has to become an example, aware of its responsibility for future generations and the need for sustainable development. Open communication and partner relations with the social community and all interested parties, primarily those related to environmental protection and tourist and visitor safety, must be main factors in the future sustainable development of the island. The adoption of an environmental management system as one of the strategic baselines of the sustainable development of the island provides it with a comparative advantage on the tourism market, thus defining it as an "eco island" with the fulfillment of all legal and other obligations, and satisfying the demands of tourists, the local community and the public, all with the goal of more successful environmental protection.

Keywords: sustainable tourism, eco island, environment protection, integrated management system, the island of Krk

JEL: R58, Q01, Q34

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1. Introduction

Market globalization has led to market strains, but it has also opened the door for tourists from new markets (e.g., China, Russia, India). Tourists from these countries have high financial solvency and can afford considerably more expensive travels. The changes caused by globalization directly influence the carriers of business activities within the tourist sector, primarily tour operators and the catering industry. These changes are manifest primarily in the increasingly present tendency towards mass services in tour operation businesses and the hospitality industry, where companies act on the principles of mass production, leading to both horizontal and vertical connections (Pavlić 2004).

Therefore, special attention should be given to the protection of the specificity of a destination on the

modern tourism market, which can be achieved by introducing an integrated destination management

* Marinela Krstinić Nižić

University of Rijeka, Faculty of Tourism and Hospitality Management, Opatija e-mail: marikn@fthm.hr

Saša Ivanović

University of Rijeka, Faculty of Tourism and Hospitality Management, Opatija e-mail: sasai@fthm.hr

Danijel Drpić

e-mail: danijel.drpic@pbz.hr

system. Such a system aims at attracting a larger number of tourists to the island of Krk, which will benefit the development of the island and the opening of new workplaces. Also, modern tourists have an increasingly high level of education, which will influence higher demand for places rich in art, culture, history and spirituality. Therefore, the demand for special products will increase, which calls upon introducing art, culture and history into the tourism offerings of a destination (for organized and non-organized groups). In addition, it is necessary to improve and enhance creative product marketing, especially given the fact that the worldwide tourism trend is the demand for new, unrevealed and little known destinations in Eastern and Middle Europe. The island of Krk, with its rich history, cultural historic heritage, natural beauty and other attractions can offer exactly that. Modern man lives under constant pressure and therefore one can assume that the demand for short vacations with the possibility of relaxation will increase. Since stress increases the need for everyday relaxation, this also contributes to the decreased quantity of financial means which are intended for leisure and relaxation, thus causing an increase in the demand for low-cost products. However, since nowadays tourists are rich with experiences they acquired on previous travels and have developed a more critical relationship towards product and service quality, special attention in forming a tourist product should be given to the relation of quality-value and price - value for money (Human resources development, employment and globalization in the hotel, catering and tourism sector, International labour organization 2001).

These trends will result in increased demand for alternative vacation possibilities instead of traditional destinations, which will contribute to increased demand for new products and services within known destinations, where the destinations of low product and service quality will have a smaller number of visitors. Loyalty to a destination will increase if tourists had positive experiences there. A modern tourist develops a critical relation towards everything that is not natural. Therefore it is necessary to put an emphasis on the authenticity and individuality of each service. Tourists have an increasing need for an individual way of visiting a destination, which results in more car rentals, so it is necessary to give attention to ensuring more parking spaces. Therefore, it can be said that the demand will increase only for those destinations which have a balanced and complete array of offers. For this reason a need is created for a tourist destination to establish a destination management system.

A lifestyle change will cause the tourist demand to include high-quality services, so one can expect increased demand for smaller capacities that are luxuriously arranged (family hotels, rural estates). For a tourism offering to "handle" such development, it will have to contain new products, service and concepts that will ensure a high level of additional value. Thus, only those who emphasize the interests of the tourist, his specific hobbies and interests, will succeed. The trend of returning to origins or "back to basics" will be relevant.

Of great importance in the modern development of tourism products is the development of modern technologies, especially the internet, which can be seen in the increasing number of arranged tourist packages via the internet. A modern tourist places a lot of importance on the availability of information and the internet makes a destination available and easily observable for anyone interested. These reasons are exactly why the role of tourism mediators (agencies and tour operators) will be reduced, because there is now the possibility for a tourist to individually combine his own itinerary, which can be adjusted to his wishes and habits. It is expected that the reservation and purchase of services via the internet will continue with its growth, so it is important to ensure that clients can make a secure online purchase. National tourism organizations will have a considerable role, especially in public relations and e-marketing. The center of modern tourism is the individual - the traveler and his or her needs. The number of people traveling is growing and travel has become a more important means of connecting people around the world. Travel also now represents an attempt to have a better life that is more in harmony with nature. Tourism in the 21st century tends towards an increase in the quality of life. If quality of life is the way in which we see our lives, then traveling contributes to increasing its level. Free time is already recognized as a dimension of life guality, especially for young people. Instead of earning a lot with no free time, they increasingly choose less earnings but more free time (a noticeable trend in the USA). It is predicted that in the 21st century people will have more free time because science and technology will relieve them from long hours and hard work. Free time is exactly what tourism or the so-called "industry of free time" is built on (Avelini Holjevac 2006).

generation of postindustrial society, are related to the strong process of changing the needs and habits of accommodation, nutrition, drinking, entertainment, playing, transport, etc. Modern tourists carry their habits and needs with them on their journeys (Cerović 2008). This is particularly influenced by the changes in the demographic structure of Europe. The number of older people (65 years old and more) is going to increase, while the whole population is going to be in better health, with longer life expectancy and greater purchasing power when compared to previous generations. The number of people over 50 who travel more should therefore increase. Parallel to the development of tourism, there will be some changes in the demand regarding the types of tourism. It can be assumed with certainty that health tourism related to cultural and natural heritage will see the largest increase. It is of the utmost importance to create further tourist development in accordance with the fact that the number of new competitive destinations, which develop and create innovative products and services, is continually growing. This increases competitiveness which our tourist destinations will face on a global level. Tourism can become a victim of its own success if it does not develop in a sustainable direction. Biodiversity, ecosystem operation, natural resources and nonrenewable cultural heritage and even urban area functions can be endangered by uncontrollable tourism development. Economic, social and ecological sustainability are the key factors for the competitiveness of destinations. Such competitiveness aims at contributing to the general welfare of a local community through the increase of employment and the preservation of natural and cultural attractions. In order to face challenges such as demography, outer competitiveness, sustainability needs and demand for different forms of tourism, the island of Krk, as well as other Adriatic islands, must focus on improving competitiveness. The stronger competitiveness of the tourism industry and a constant orientation towards sustainability will also contribute to the satisfaction of tourists and the better positioning of the island as a

2. Sustainable Development of Tourism

The needs of modern people, who belong to the

In order to ensure sustainable development of tourism it is essential to establish dialogue and partnership between interest groups in tourism. Tourism includes a wide span of interest groups and political measures on different levels. Partnership between all those involved is necessary on all levels of decision-making processes related to tourism. It has to be the main component of functioning on national, regional and local levels, as well as public and private levels.

Challenges which the island's tourism is faced with demand a coherent answer on the level of island tourism communities. That policy should be directed towards clear and realistic goals which are determined together by employers, employees and the local community, and should in the best possible way use the available resources with a continuous supplementing of already conducted activities, all of which will add to the value of national and regional political measures. The main goal of this policy will be the improvement of the island's tourist industry competitiveness and the creation of new and better workplaces through the sustainable development of tourism. Sustainable tourism is tourism based on an agreement with the local community, entrepreneurs and other factors. There is now a tendency to develop tourism in a way that is fair and acceptable for local communities, economically sustainable over a long period of time and that also avoids damaging tourist attractions or the physical environment. It offers tourists high-quality and diverse experiences in standard and specialized markets (Eko-osviještenost kod putovanja, održivost u turizmu; Kristofor putnička agencija).

Sustainable development of tourism meets the needs of current tourists and local residents, while at the same time preserving resources for future development. Such development entails resource management so that basic economic, social and aesthetic requests are met, with the concurrent preservation of cultural integrity, basic ecological processes and biological diversity [1]. Sustainable development of tourism uses natural and cultural heritage and aims at increasing the number of destination visitors and increasing profit, but in such a way that preserves the destination and its business for future generations.

Figure 1 visually presents the basic elements of satisfaction of quality management and other factors for a tourist destination.

leading tourist destination.



Source: Adapted from Vujić, V.: Poslovna Politika, http://www.poslovnapolitika.co.yu/Teme/vujic.htm **Figure 1:** Elements of tourist destination quality management

Figure 1 shows that the opinions and interests in a tourist destination include the interests and satisfaction of entrepreneurs, managers, employees, guests, residents and society, all of which have to be balanced by finding a quality that will please all the interested parties and their interests. This balance is the only way to create an optimal business in any tourist destination. Sustainable development (Vujić, Poslovna Politika) of tourism is based on respecting ecological sustainability, socio-cultural sustainability and economic sustainability. Quality must become a permanent decision, and a prerequisite for economic success and the contentment of tourists and local residents. This should be completely based on the usefulness and necessity of sustainable development as the main mission over the long term. Interested parties have to be resolute in striving to raise quality and environmental protection throughout all functions and organizations, especially in those related to tourism. Therefore, it is essential to encourage the implementation of the ISO 9001:2000 system, as well as the environment management system according to the ISO 14001:2004 regulation, and to integrate them into a single system for tourist destination management. The implemented and documented system provides coherence to business activities in every aspect, legal or otherwise, as well as maintenance and balance to the system of environmental protection with new commitments, constantly cooperating with the local community, tourists and other partners. Constant identification, evaluation of business risks and their management will enable the quality, stability and rationality of the interested parties' businesses, as well as further sustainable development of the island of Krk. This will also be positively influenced by a proper communication-information system that allows for efficient and rapid communication between all the interested parties. Quality arises, is implemented and controlled on all levels, from the local government to the tourist communities, leasers and others. It is necessary to develop the awareness that all participants have to cooperate in the improvement of quality, environmental protection and safety, which can be supplemented by constant education, improvement and the perfection of all the destination's factors. With the preventive measures of environmental protection and optimal resource use in construction projects and management, as well as waste management practices, any destination can become an example of awareness of its responsibility to future generations and the need for sustainable development. Open communication and partner relations with the community and all other interested parties, primarily relating to environmental protection and tourist and visitor safety, must be the main factors for future sustainable development. The adoption of an environmental management system as one of the strategic baselines of sustainable development provides a comparative advantage on the tourism market.

The paper will proceed with a survey of possible sustainable development and quality system management implementations as unique approaches to the island of Krk, as adopted within the concept of Krk Agenda 21.

By integration of both systems multiple benefits will be obtained for the local community, visitors, the island, the region, and the country as the whole.

Implementation of environmental management and quality management systems into the existing system of destination management on the island of Krk enables the management, control and constant improvement of the destination's features, which can influence the quality of business and the state of environment in a way that avoids the unnecessary doubling of documentation and activities. The rational merger of these systems, rather than the creation of new ones, will contribute to the reduction of expenses, better information flow and more rational resource usage. Finally, quality management and environmental management systems aim to ensure the quality and preserve the environment of the island of Krk, as well as to maintain constant control over all of the

destination's processes. The goal of the system is for local government, tourist agencies and other interested organizations to use the management system as an objective, documented and measurable tool for planning, realizing and monitoring goals. This also ensures the reduction of risks and continual improvement of environment protection and quality enhancement. Finally, this leads to the secure sustainable development in the future of the island of Krk. In the long term, this integral system aims to ensure the effective functioning and the development of the tourist destination of the island of Krk. Management activities thereby have to be focused on numerous interest groups, which include buyers, employees, suppliers, investors, and the local and global communities. The goal of the implementation of such a system is, among others, to ensure satisfaction, which is essential for the business success of all interested parties. For a successful implementation of the integral quality management system, it is necessary to choose an adequate methodology and to integrate more internationally recognized norms of quality management into one system. The adoption of such a vision and development strategy becomes a criterion of survival, sustainable development and a foundation for the business optimization of any tourist destination, including the island of Krk.

2.1. Concepts of Total Quality and Sustainable Development Management in the Example of the Island of Krk

The island of Krk is defined as an eco-island. In order to enable the improvement of its former method of destination management, it is necessary for all the parties in a tourist destination to implement the Total Quality Management System and Environmental Management System as a foundation of their business, in the form of the Integrated Quality Management (IQM) of the destination. Total Quality Management (TQM) is a system that improves, as well as increases, the flexibility, effectiveness and efficiency of businesses and other activities. TQM tends to create conditions for all employees to jointly realize, maximally, efficiently and effectively, one goal: to create a product and offer a service when the consumer wants it, where the consumer wants it, and how the consumer wants it every time (Avelini Holjevac 1998). TQM is based on the concept of constant enhancement and improvement of processes, permanent quality and team work. All of this results in constant enhancement (Avelini Holjevac 2005). Although very complex, the total quality management of a tourism product is possible and necessary. Tourists want more and more, and the goal of a tourism business is to please and exceed tourists' expectations. Quality becomes a crucial factor of efficiency and competitiveness on the turbulent tourism market (Avelini Holjevac 1998). In addition to TQM, it is necessary to give special attention to the protection of the island of Krk's environment and countryside, which will be achieved through the integration of the Total Quality Management System and Environmental Management.

Environmental management takes into account the goals of environmental protection when planning, implementing and controlling the activities of hotel companies, institutions, tourist communities and tourist destinations in general in order to decrease the burdens on the environment as well as to ensure long-term tourism goals.

Integrated Quality Management (IQM) is a relatively new trend of quality management for European tourist destinations. It developed in the 1990s as a response to real changes in the behavior and demands of tourists, the pressure of competition (in terms of supply and demand), and changes in the destinations, which occurred as the consequences of economic, social, psychological, safety and ecological factors on all segments of life, as much in urban as in rural, coastal or continental destinations. Unlike the traditional approach to quality management, which mostly refers to individual tourism companies, integrated guality management for destinations means an equal fulfillment of the needs of visitors, local residents and all those included in the tourist sector. A forbearer of the concept of IQM is the concept of Integrated Management. This term was first presented at St. Gallen University in Switzerland. Its baseline focuses on business results management. Later, in 1995, on this basis, the IQM or Process Oriented IQM was created, under the strong influence of the quality management philosophy (Živojinović, Sinergija naprednih upravljačkih koncepata i metoda pod modelom integrisanog menadžmenta kvalitetom).

2.2. An Analysis of the Situation of the Island of Krk

The island of Krk, second in size among the Adriatic islands, nearest to the shore and a sort of suburb of the city of Rijeka, represents a gate to the warm sea for tourists arriving from nearby European countries. The island of Krk is nowadays confronted by doubt over whether to allow further area devastation by apartment building and the construction oil reloading plants and petrochemical plants on the northern parts of the island, i.e. in the Omišalj municipality, or to preserve the already disrupted natural landscape. If further investments into the already existing industrial capacities are made, this will create a greater gap between the desires and the possibilities of further development of the island's tourism sector. The recent uncontrolled development represents the consequence of a particularly favourable traffic and geographical position. The island is becoming a recognizable destination for entrepreneurs and investors with business interests in investing in market oriented apartment construction, which has uncontrollably consumed the whole area of the island. As a consequence there has been a decrease in already limited resources and in the areas for the development of new tourism attractions. Within the island of Krk two economic sectors are converging – tourism and industry. Industry is developed on the northern part of the island. However, such a form of development is not sustainable in the long run. According to the sustainability system, the southern part of the island has greater possibilities in further development for quality forms of tourism offerings, and sustainable tourism in the southern part of the island of Krk is possible by means of quick interventions in order to stop it from being overrun by uncontrolled development. Sustainable tourism is of the utmost importance for the development of tourism and mostly depends on activities related to natural surroundings, historical heritage and cultural interest, as well as constructed capacities for accommodation and catering services, which suffice on the island of Krk and represent a valuable base for the sustainable development of both the tourism industry and the overall economy. If the island of Krk's resources are destroyed or their value diminished, the destination will not be able to attract potential tourists any more, which will result in an unsuccessful development model for future generations. Contemporary tourism demands that the destination have a high level of environmental quality, with a tendency of continuous growth in terms of quality criteria. The experience of the island of Krk will be complete only if the offered activity is harmonized with the environment and the desired and expected standards for activities, cleanliness and orderliness. The basic picture today of the island of Krk represents a result of millennial influence on natural resources interrelated with the impact of human activity. According to the latest census from 2001, the island of Krk has 17,860 inhabitants. The last four decades show a positive demographic trend (exept for 1971), which, unfortunately, represents the result of settlement only and not of natural growth. The number of inhabitants in 1991 was greater by 2,530 inhabitants or 18.90% when compared to 1981, and by almost 2,000 inhabitants or 11.90% in 2001 if compared to 1991. However, such data can deceive, as a large number of "week-end inhabitants" listed their residence as on the island of Krk to prevent or decrease property taxes. Simultaneously, with employment in tourism, the interest of local inhabitants from the inland part of the island was growing for building their own houses in central tourism areas by the sea. Furthermore, such housing held the possibility of additional earnings by means of renting private accommodations. All of this caused a sudden abandonment of the settlements in the inland part of the island, and consequently a drop in agricultural production and the agriculturally active population in general. Therefore the influx of inhabitants and of housing affected mostly the central coastal settlements. Every settlement on a larger scale brings the problems of waste disposal, sewage systems, accommodation, and traffic. An excessive number of tourists within ecologically sensitive areas often bring great damage to the main attractions - the environment itself.

Precisely because of overbuilding in the island's coastal areas and the loss of comparative advantages within the tourism market, the purposeful design for Krk of a unique tourism plan based on sustainability, preservation of the environment and nature, and increasing life quality on the island is necessary. This will all be enabled by the implementation of local Krk Agenda 21.

3. Local Agenda 21 of the Island of Krk

It is necessary for local government and selfgovernment to ensure the application of *Agenda 21* [2] for tourism on the island of Krk. Setting development and employment as its primary goals is in accordance with promoting social and ecological goals, and it will contribute to the sustainability of tourism. A renewed tourism strategy of sustainable tourism is a key element of achieving the goals of sustainable development determined by the law: the improvement of welfare and life conditions in a sustainable way for present and future generations. The main baselines for tourism sustainability on the island of Krk must be to ensure the economic, social and ecological sustainability of tourism on the island of Krk, which is essential in contributing to sustainable tourism on the island of Krk as a whole, as well as for the further growth, competitiveness and market success of this economically important sector. The elaboration and implementation of Agenda 21 is a longterm process. For the promotion of economic and social sustainability of tourism some specific actions are necessary. These are (Dolenec 2007):

- Identification of insular, but also national and international, measures in order to support small and middle sized tourism companies, and to develop the process of exchanging successful experiences.
- 2. Performing evaluations of the economic influence of better availability within the tourism sector on macroeconomic growth and employment.
- Investigation of business options for small and middle companies, and their service quality and competitiveness.
- 4. Following contemporary trends of learning through work in the tourism sector of the sea and coast.

Like many Mediterranean destinations, for the coastal destinations of the island of Krk (Malinska, Baška, Punat i Krk) one can say that the symptoms of maturity have become visible. This particularly refers to the degradation of countryside and the disturbance of ecological balance, the overpopulation of coastal insular settlements, and the gradual loss of the destination's prestige and lesser quality of visitors. It can be established that today the vitality of the tourism sector of the island of Krk, which is its main economic branch, is threatened. This can result in or has already resulted in the endangerment of overall local development. Therefore, it is essential for the local community to begin with a number of programs and actions, strategies for repositioning tourism and local development in accordance with the demands of sustainability and regulations of the Earth Summit held in Rio de Janeiro in 1992. It is necessary to create Agenda 21 Krk, which would determine the directions of activities, initiatives and urgent actions which are agreed upon within the local community. This could be a kind of start to IQM implementation on the island of Krk. It is definitely necessary to form an association which would guarantee the execution of the goals of Agenda 21 Krk, and it would consist of municipalities' mayors and experts for different areas, indicating that this is an interdisciplinary process. Proposition for measures for Agenda 21 – Krk, which should:

1. Stop the pressure from people and limit growth, rehabilitate terrain and coastal areas

- 1. New physical plans of municipalities and the town of Krk
- 2. New plan activities
- 3. New regulations for eco-responsibility
- 4. Local residents' integration support, coexistence and life quality
- 5. Social integration, education and employment of local residents
- 6. Promotion of coexistence, cultural integration and life quality
- 7. The island of Krk the island of sustainability
- 8. The island of Krk without harmful polluters
- 2. Protect onshore and sea treasures and encourage the establishment of a regional tourist ecological plan with the purpose of environmental protection
- 1. Plan for natural resource and countryside management
- 2. Natural water springs protection
- 3. Land and forest protection
- 4. Natural conservation of beaches
- 5. Sea quality restoration

3. Reduce the biggest harmful influences on the environment and countryside

- 1. Enable sustainability with the help of the General Plan
- 2. Stabilize supply of drinking water within a 10 year period
- 3. Form and implement an energy saving plan
- 4. Promote the saving, recycling and reuse of solid waste
- 5. Start a project for separation, collection and recycling
- 6. Public transport system reorganization
- 7. Moratorium on big road infrastructure
- 8. Five-year moratorium on big operations in coastal areas
- 9. Pilot program for natural beach conservation
- 10. Rural development incentive
- 11. Ecological inspection
- 12. Opening of "Green Office 21"

4. Restore historical, cultural and natural heritage

- 1. Get to know and conserve the historical and cultural heritage of the island of Krk
- 2. Archeological park "Cickino"
- 3. Walking paths, paths of Glagolitic alphabet, sheepbreeding, olive oil....

- 4. Opening of the Museum of the Island of Krk
- 5. Establish public historical-cultural heritage

5. Encourage full restoration of residential and tourist areas

- 1. Restore or level the buildings in the centers of the island's towns which are ruinous and disfigure the countryside
- 2. Pilot program "Environment enhancement area"
- 3. Replace growth with sustainable quality, encourage bigger consumption per visitor and reduce seasonality
- 4. The island of Krk the island of innovations
- 5. Modernize tourism infrastructure
- 6. Encourage new tourist products develop recognizability
- 7. Develop quality and eco-quality
- 6. Enhance public transport and encourage people to walk or cycle in the centers of the island's towns
- 1. Enhance public transport
- 2. Ecological traffic transformation plan
- 7. Introduce sustainable management into key sectors which use the environment: water, energy and waste
- 1. Ten-year plan of water supply: program of water supply management in order to stabilize/reduce demand
- 2. Program of local energy supply management in order to stabilize/reduce energy demand
- 3. Ten-year plan of waste management in order to reduce and recycle waste and produce compost

8. Invest in human capital and knowledge sources, and increase and diversify financial system

- 1. Sustainable development agency
- 2. Human resources investment
- 3. Encouragement of new entrepreneurial projects
- 4. Rural areas expansion
- 9. Modernize town government and increase the capacity of planned public and private investments
- 1. Town organization modernization
- 2. Increase investment capacity

Agenda 21 is based on the cooperation of the public and private sectors, i.e. the representatives of local government and expert and citizen forums, and on the vision of the island of Krk as an integrated system. The expected results of integrated quality management system implementation on the island of Krk are important for many reasons.

As an example of the expected results we can use the Mediterranean destination of Calvia. Calvia is situated on Mallorca and enacted Calvia Local Agenda 21, Sustainability of a Tourist Municipality Plan of Action (10 strategic lines of action and 40 initiatives) and is one of the leading Mediterranean tourist destinations.

Calvia will serve as an example for the further sustainable development of the island of Krk, as it is extremely important to avoid the errors Calvia attempted to master, and which are threatening the island of Krk as well, including mass tourism, offer uniformity, seashore overdevelopment, etc. Through the application of the modified but already implemented model of Calvia, the island of Krk should secure the leading place within the tourism market as a destination of originality, excellence, and particularity.

Example: Calvia

Since 1960 the population has increased from less than 3,000 to more than 50,000. With an area of 143 km², along which are 60 km of beaches, there is a very diverse eco-system. It is largely covered with forests and has 112,000 tourist accommodation units, which take more than 1,600,000 visitors a year. Calvia is a typical example of a mass tourism destination offering sun and sea. Because it held back on its tourism market and reached destination maturity, Calvia decided to create Calvia Agenda 21. By introducing an IQM system, within a period of only three years (1998), through the enforcement of the reorganization of the city administration and prequalification, Calvia has provided employment for over 1,000 people. At the same time, the budget debt was reduced by 15%, and big changes occurred in the countryside because old and derelict hotel buildings disfiguring the countryside were leveled, and some parts of the coast were restored, which contributed to the increased satisfaction of tourists, tourist professionals and local residents (Know Calvia, enjoy Calvia; environmental information).

4. Conclusion

In order to prompt further sustainable development of the island of Krk in general, and thus its tourism, it can be concluded that it is necessary to bring concurrent

regulations which will greatly facilitate achieving this goal, which is the development of tourism on sustainable grounds. Regulations in many areas of politics can in the future be very significant for the competitiveness of the tourism industry and tourist destinations. Given the fact that there are many policies which talk about tourism, it is essential to actively promote better regulations on national, county and local levels. It is necessary to make an analysis of legal proposals which are in the process of legislation, whether on a national, regional or local level, with an attempt to simplify the existing legal solutions as much as possible. In addition, it is necessary to work on the constant improvement and expansion of the usage of new offerings that could influence evaluation processes. This integrated approach ensures that tourism, during the evaluation of all offers which can influence the sector, will be taken into account.

Also, it is necessary to constantly consult with interest groups on how the program of simplification should develop in the years to come. Tourism interest groups can actively participate in trying to improve the regulatory environment. Activities should be expanded onto the national level in order to avoid cumulative administrative weight in the tourism industry.

Globalization, demographic changes and traffic development largely influence the accelerated development of this "industry". Thanks to the diversity of attractions and the quality of tourism services, the island of Krk can become a leading tourist destination, and this is why tourism can have a big role in achieving the goals of the development and employment strategy.

Tourism has had an important role in the development of the majority of European regions, and accordingly the regions of our country as well, which includes the island of Krk. The development of tourism infrastructure contributes to local development. Workplaces open even in places which were in the past identified as areas of industrial and rural set-backs or that must undergo urban restoration. The need for the regions' activities increase and results in a larger number of destinations and interest groups that turn to sustainable and ecologically acceptable aspects in practice and politics. Sustainable development of tourism has had a huge role in the preservation of the cultural and natural heritage of an increasingly large number of areas, from art, local gastronomy and crafts, to the preservation of biodiversity. The aforementioned factors also have positive effects on employment and development, which

has been recognized by interest groups, and has also been indicated by Agenda 21 for tourism.

Thanks to tourism, the visitors to the island of Krk's destinations come into contact with its values and heritage. Tourism also contributes to a better understanding between people and helps in the process of forming the island's identity. Furthermore, it promotes dialogue between different cultures through the contact of different social, economic and cultural groups. In the future, so-called "green or eco hotels" should be developed. The hotels of the future will be called "green hotels" or "eco hotels". All of their features, from the position of the hotel, its construction, amenities, hotel services and products, will be in the service of nature preservation and will serve both worker and guest. Creating "eco oases" and hotels in nature will become a necessary trend (Avelini Holjevac 2003).

In the period after Croatia's independence, the European market has discovered the diversity of its tourist destinations and offerings, as well as its numerous natural and cultural attractions, hitherto unknown to European citizens. The development of tourism in new democracies will contribute to the generation of development and new workplaces for the tourism industry. Tourism is therefore an important sector of the economic strategy of each country and its development, taking into account that its implementation influences more than state administration.

Sustainable development (Vujić, Poslovna Politika) of tourism is based on respecting ecological sustainability, socio-cultural sustainability and economical sustainability. On the island of Krk, as a leading and the nearest destination for tourists from foreign markets, quality must become a permanent decision and prerequisite for economic success and the contentment of tourists and local residents. This should completely be based on the usefulness and necessity of sustainable development as the main mission in the long term. Interested parties have to be resolute in striving to raise quality and environmental protection across the board, in all functions and organizations, especially in those related to tourism. Therefore, it is essential to encourage the implementation of the ISO 9001:2000 system, as well as the environmental management system according to the ISO 14001:2004 regulation, and to integrate them into a single system for tourist destination management. This implemented and documented system provides coherence to business activities in every regard, legal or otherwise, helps fulfill other demands, such as

maintenance and balancing the system of environmental protection with new requirements, and helps for constant cooperation with the local community, tourists and other partners. Constant identification, evaluation of business risks and their management will enable quality, stability and rationality among interested parties' businesses, as well as further sustainable development of the island of Krk.

Although Croatian tourism in the last few years and at the moment is in a good position, showing steady improvement in all important indicators, for its further successful and sustainable development it is necessary to additionally improve infrastructure, prices and services relations, the diversity of services and the education of employees, as well as proliferate promotion and marketing, and balance tourist development throughout the whole country over the whole year.

Sustainable tourism has to be the main goal of every destination, but, because of bigger investments, it brings also bigger prices for end users. In order to reduce this influence, it is necessary to connect local destinations with regional ones, which will result in greater additional value. It is important to create and organize the management of destination control and planning.

Sustainable development is crucial here because if the region's and destination's development results in the devastation of space and natural beauty, it will certainly have a negative effect on tourist demand. There is a continuous increase in need for the safety of residence in destinations, so the majority of tourists will abandon unsafe areas. Therefore, one can assume that the expenses of tourist safety will grow. However, the island of Krk can offer that needed peace and safety.

The facts presented above point toward the conclusion that the process of constant enhancement of service quality, from accommodations, food and drinks (the catering and hospitality industries), to services which motivate people to travel (recreation, entertainment, health, events, religion, spiritual balance, etc.), services during travel and communication (transport, service, banking, etc.), as well as the development of other special and uncommon elements of the offer (Cerović 2008) will help the island of Krk, a high order destination, reposition itself on the tourism market and become the leading island destination in Croatia.

Endnotes

- [1] Definition of sustainable tourism according to the World Tourism Organization (UNWTO), <u>http://www.world-tourism.org/sustainable/concepts.htm</u> (24.04.2008)
- [2] Agenda 21 contains generally accepted principles of sustainable development of tourism which were agreed on by the governments of 182 countries at the Earth Summit in Rio de Janeiro in 1992. Agenda 21 is an instruction for individuals, employers and government organizations for directing development in such a way that it helps the society but also takes care of the environment. Agenda 21 is a document that contains 40 chapters divided into 4 sections.

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Corporate Ownership and the Technical and Scale Efficiency of Pharmaceutical Firms in India – Empirical Evidence

Kuldip Kaur, Sunil Kumar *

Abstract:

In the existing literature, the theoretical models suggest that foreign-owned firms perform better than domestic firms and that private sector firms perform better than public sector firms. The present study is a modest attempt in this regard to empirically test and compare the differences in the technical and scale efficiencies of 36 public limited companies, private sector firms and foreign firms belonging to the pharmaceutical industry of India using the DEA model. The analysis shows that overall technical efficiency was different in the case of private domestic and public sector firms in the year 1990, i.e., the pre-reform period. The difference was also significant in the case of private foreign firms in the pre-reform period. However, in the subsequent post-reform years, there were no significant differences.

Keywords: Corporate Ownership, Technical Efficiency, Scale Efficiency

JEL: G34, D61, G21

1. Introduction

Productivity and efficiency growth are the key factors for the development of any industry. An efficient industry has significant spillover effects on the economy. In addition, economic development often is viewed as a process through which inefficient firms converge with efficient firms. A necessary condition for this convergence is that inefficient firms get the benefits or spillovers from efficient firms. It has been about two decades since India initiated the LPG policies with the core objective of improving the efficiency of the industrial sector of India. The channel behind was to make imported inputs cheaper and more accessible to the firms and exploring the advantages in the domestic and international markets. In addition, these policies have been designed to attract more and more foreign firms (FDI) into the economy. The expectation was that, since foreign firms are supposed to be more efficient than domestic firms, more spillovers are likely to emerge for these firms. This point is made clearer by Helpman et al. (2004), when they concluded that in advanced economies the most efficient firm is that which engages in FDI. One can also assume that if the domestic firms are able to follow the DOI: 10.2478/v10033-010-0019-y

productivity level of a foreign firm, they can reach the world standard.

In the existing literature, the theoretical models suggest that foreign owned firms perform better than domestically owned firms. This is mainly because of the superiority of the firm's specific assets, particularly in the case of intangible assets related to the production process, marketing networks and management capability, which is a necessary condition for a firm to become a multinational corporation (MNC). Also, foreign firms are expected to be more efficient compared to domestic firms because only through greater efficiency

* Kuldip Kaur

Punjab School of Economics Guru Nanak Dev University, India e-mail: kuldeepgarcha@yahoo.co.in

Sunil Kumar

Punjab School of Economics Guru Nanak Dev University, India e-mail: sunil12eco@yahoo.com can they manage their production in another country. There have been a number of empirical studies on the effects of ownership of firms on productivity and efficiency. However, these empirical findings are not consistent and very often they are contrary to each other. One group of studies observed that foreign firms are more productive and efficient than domestic firms. These results have been reached for different countries and also from cross country comparisons. The studies of Hill (1988), Blomstrom (1990), Sjoholm (1998), Ramstetler (1999), Okamoto and Sjoholm (2000), Hallward Driemcier, larossia and Sokodoff (2002) and Bernard and Bradfrd (2004) Camson et al (2002), Collins and Harris (1999), Grima et al (1999) have found that foreign firms use better technology in production than domestic firms.

Another important point is that in the case of developing countries like India, foreign firms are assumed to be more efficient than domestic firms because they have better access to modern and advanced technology. This is one of the reasons why governments attract more foreign firms with the expectation that flow will bring advanced technology, and thus generate productivity gain for the domestic firms. In addition, there may be a number of other reasons like foreign firms generating more output from the inputs, inability to charge high prices due to lower product quality or inferior marketing, fewer intangible assets, higher cost of capital, more inefficient vertical integrations, etc.

However, the studies of Artken and Harrison (1999), Konings and Murphy (2001), Oguchi (2002) and Barbose and Lousi (2005) could not find any significant difference in the performance of both types of firms. In the case of India, very few studies are available which try to find out the efficiency of the different sectors in India (see, for example, Mitra (1999), Agarwal (2001), Driffield and Kambhampati (2003), Kambhampati (2003), Golder, Ranganathan and Banga (2004), Kathuria (2002), etc.) Pandit and Siddharthan (1998, 2003) have shown that MNC's have many advantages over domestic firms (and therefore are better performers). Also Chhibber and Majumdar (1997) have failed to find any difference between both types of firms.

The explanation for this conflicting evidence is that the productivity and efficiency gains from globalization of firms depend not only on ownership but on a range of factors, for example the absorptive capacity (Borzenstein et al, 1998; Alfardo et al, 2003; Edison et al, 2002; Durham, 2004) of the country. The initial conditions that capture the absorptive capacity of host countries include the initial level of development (Blomstorm et al, 1992), existing human capital development (Borenztein et al, 1998) trade policy (Balasubramanyam et al, 1996) financial development (Durham, 2003; Alfaro et al, 2003), legal based variables (Durham 2004; Edison et al, 2002) and general government policy (Edison et al, 2002).

To contribute to this ongoing debate the present paper seeks to compare the efficiency of domestic firms and foreign firms. Domestic firms are sub-divided into two segments – Public Ltd. Companies and private sector firms. The paper is structured to comprise four sections in all including the present one. Section II discusses the data base and methodology used in the study. Section III presents the results of the analytical findings and section IV concludes the paper and draws some policy implications on the basis of empirical findings.

2. Data Base and Methodology

The importance of the efficient use of resources has long been recognized, but mainstream neoclassical economics assumes that the producer in an economy always produces efficiently. In reality, however, the producers are not always efficient. Two identical firms never produce the same output and cost and profits are also not the same. This difference in output cost and profits, etc. can be explained in terms of technical and allocative inefficiency. Further, it is significant to find out whether the observed inefficiency in different firms is due to managerial underperformance or due to inappropriate scale size. The present study is an attempt in this direction where the measurement of the extent of technical, pure technical and scale efficiencies of individual firms belonging to the pharmaceutical industry of India has been attempted using Data Envelopment Analysis (DEA).

Before proceeding further, it is necessary to elaborate the concepts of technical, pure technical and scale efficiencies. Technical efficiency relates to the productivity of inputs (Sathye, 2001). The technical efficiency of a firm is a comparative measure of how well it actually processes inputs to achieve its outputs, as compared to its maximum potential for doing so as represented by its production possibility frontier (Barros and Mascarenhas, 2005). A measure of technical efficiency under the assumption of constant returns to scale (CRS) is known as overall technical efficiency (OTE). The OTE measure helps to determine efficiency due to the input/output configuration as well as the size of operations. In DEA, the OTE measure has been

decomposed into two mutually exclusive and nonadditive components; pure technical efficiency (PTE) and scale efficiency (SE). This decomposition allows insight into the source of inefficiencies. The PTE measure is obtained by estimating the efficient frontier under the assumption of variable returns to scale. It is a measure of technical efficiency without scale efficiency and purely reflects managerial performance in organizing the inputs into the production process. Thus, the PTE measure has been used as an index to capture managerial performance. The ratio of OTE to PTE provides the SE measure. The measure of SE demonstrates the ability of the management to choose the optimum size of resources, i.e. to decide on the firm's size or in other words, to choose the scale of production that will attain the expected production level. Inappropriate size of a firm (too large or too small) may sometimes be a cause of technical inefficiency.

Data envelopment analysis (DEA) introduced by Charnes et al (1978) based on Farrell's work (Farrell, 1957), is a non-parametric technique for measuring the relative efficiency of a set of similar units, usually referred to as decision making units (DMU's). DEA is capable of handling multiple inputs and outputs without requiring any judgment on their importance. Earlier, the most widely applied measure to evaluate the performance of firms had been financial ratio measures. The fundamental limitation of the traditional univariate ratio analysis is that the choice of a single ratio does not provide enough information about the various dimensions of the performance of a firm. In fact, the firm's performance represents the complexity of multi-dimensional outputs and inputs. Hence it requires more than a single ratio or even selected ratios to characterize it. Another limitation of the financial ratio analysis is the choice of a benchmark against which to compare univariate or multivariate scores from ratio analysis. So the appropriate measure is DEA. This method is able to assess multiple variables simultaneously. Therefore, one can consolidate multiple measures of financial performance such as; sales, profit margin, total assets etc. in a single summary of performance measures.

DEA is an alternative as well as a complement to traditional approaches. Some methods fail to estimate the relative efficiency of individual decision making units (DMU's) as they only identify the central tendencies. DEA is a performance assessment tool useful for calculating patterns of dynamic efficiencies. Using only observed output and input data for observations, the DEA algorithm calculates an ex-post measure of how efficient each observation was in converting inputs to outputs accomplished by the construction of an empirically based production frontier and by evaluating each observation against all the others included in the data set.

Several different mathematical programming models have been proposed in the literature (see Charnes *et al.*, 1994; Cooper *et al.*, 2007, for details). Essentially, each of these models seeks to establish which of *n* DMUs determine the *best practice* or *efficient frontier*. The geometry of this frontier is prescribed by the specific DEA model employed. In the present study, we utilized the CCR model, named after Charnes, Cooper, and Rhodes (1978) and the BCC model, named after Banker, Charnes and Cooper (1984) to obtain efficiency measures under CRS and VRS assumptions, respectively.

Formal notations of used input-oriented¹ DEA models for measuring TE scores for DMU *o*, under different scale assumptions are as follows.

[1] (i)
$$\min_{\theta_o, \lambda_1, \lambda_2, \dots, \lambda_n, S_i^-, S_r^+} \quad TE_o = \theta_o - \mathcal{E}\left(\sum_{i=1}^m S_i^- + \sum_{r=1}^s S_r^+\right)$$

Subject to

$$ii) \sum_{j=1}^{n} \lambda_{j} x_{ij} + s_{i}^{-} = \theta_{o} x_{io}$$

$$iii) \sum_{j=1}^{n} \lambda_{j} y_{rj} - s_{r}^{+} = y_{ro}$$

$$iv) s_{i}^{-}, s_{r}^{+} \ge 0 \qquad (i = 1, ..., m; r = 1, ..., s)$$

v) $\lambda_i \ge 0$, if constant returns-to-scale

vi)
$$\sum_{j=1}^{n} \lambda_j = 1$$
, if variable returns-to-scale

where x_{io} = amount of input *i* used by DMU *o*,

 y_{ro} = amount of output r produced by DMU o,

- m = the number of outputs,
- s = the number of inputs,
- n = the number of DMUs, and
- ε = a small positive number.

¹ Concerning the model's orientation, Coelli and Perelman (1999) show that the choice of orientation does not significantly alter efficiency estimation results. The choice of the appropriate orientation is not as crucial as it is in the econometric estimation case and, in many instances, the choice of orientation will have only minor influences upon the scores obtained.

The solution to problem [1] is interpreted as the largest contraction of DMU o's input that can be carried out, given that DMU o will stay within the reference technology. The restrictions *ii*) and *iii*) form the convex reference technology. The restriction iv) restricts the input slack (s_i^-) and output slack (s_r^+) variables to non-negative values. The restriction v) limits the intensity variables to non-negative values. The model involving i) – v) is known as the envelopment form of the CCR model and provides Farrell's input-oriented TE measure under the assumption of constant returns-to-scale. The measure of efficiency provided by the CCR model is known as overall technical efficiency (OTE) and denoted as θ_o^{CCR} .The last restriction imposes variable returns-to-scale assumption on the reference technology. The model involving i) – iv) and vi) is known as the BCC model and provides Farrell's inputoriented TE measure under the assumption of variable returns- to-scale. The measure of efficiency provided by the BCC model is known as pure technical efficiency (PTE) and denoted as θ_{a}^{BCC} . The ratio $(\theta_{a}^{CCR} / \theta_{a}^{BCC})$ provides a measure of scale efficiency (SE). Note that all aforementioned efficiency measures are bounded between one and zero.

As already stated, in the present study the decision making units (DMU's) are private sector, public sector or foreign owned (MNC's) firms, since the study aims at evaluating the efficiency of the different sets of firms under different management. In total 36 firms (12 from each of the abovementioned categories) belonging to the pharmaceutical industry of India have been chosen. These firms are those which survived throughout the period studied (i.e. 1989-90 to 2003-04) and remained listed on the Bombay Stock Exchange, Bombay. The required data for these sample firms have been culled for three years, i.e. 1989-90 (pre-reform period), 1999-2000 and 2003-04 (both indicating post-reform years), for the purpose of comparing the efficiency of the sample firms during the pre-reform and post-reform periods. The main source of data is the Prowess Database, 2005 version, of the Centre for Monitoring the Indian Economy (CMIE). It contains information on about 10,000 companies. The coverage includes public, private, co-operative and jointsector companies. Approximately, the coverage of this database is 70 percent of the economic activities of the country. The information available includes data from companies' profit and loss accounts, balance sheets and funds from accounts.

Three input measures (raw material cost, wages and salaries and gross fixed assets) and one output measure (net sales) have been used to compute the efficiency scores. To test whether the difference between the efficiency score of the sample firms on the basis of the ownership pattern is significant or not, a Mann-Whitney test was applied.

3. Empirical Results

In this section, the input-oriented efficiency scores obtained from the CCR and BCC models have been discussed. It is significant to ask here that, given that input-oriented efficiency measures answer the question, how much can input quantities be proportionally reduced without altering the output production quantities? Table 1 presents the overall technical efficiency, pure technical efficiency and scale efficiency scores of three groups of firms in the year 1990, representing a pre-reform year. Each group represents a set of twelve firms belonging to the pharmaceutical industry of India. These groups have been separated on the basis of the ownership pattern of these firms. The first group represents firms belonging to the private sector under domestic ownership. The second group represents private firms under foreign ownership. The third group belongs to firms from the public sector.

The results indicate that the OTE (in percentage terms) of private domestic firms is characterized by asymmetry, as it ranges between 38.3 percent and 100 percent. The average efficiency scores of these private firms turned out to be 0.786. This suggests that an average private domestic firm, if producing its output on the efficient frontier instead of its current (virtual) location, would need only 78.6 percent of the inputs currently being used. The connotation of this finding is that the OTIE of private domestic firms in the Indian pharmaceutical industry is 21.4 percent. This suggests that, by adopting best practice technology, these firms can reduce their inputs of raw material, wages and salaries and gross fixed assets by at least 21.4 percent and still produce the same level of output. The potential reduction in inputs from adopting best practices varies from firm to firm. Alternatively, these firms have the scope of producing 1.27 times (i.e. 1/0.786) as much output from the same level of inputs.

Since a firm with an OTE score equal to 1 is considered to be the most efficient among the firms included in the analysis, and a firm with a score of less than one is deemed to be relatively inefficient, it can be observed

Panel A	: Private Domestic Firms						
Ne	Nome of the firm	OTE	OTIE	PTE	PTIE	SE	SIE
NO.	Name of the firm	Score	(%)	Score	(%)	Score	(%)
1.	Ambalal Sarabhai Enterprises Ltd.	0.182	18.8	0.815	18.5	0.996	0.4
2.	Amrutanjan Ltd.	0.713	28.7	0.721	27.9	0.989	1.1
3.	Cipla Ltd.	0.653	34.7	0.753	24.7	0.867	13.3
4.	Deepak Fertilizer and Petrochemicals Corpn. Ltd.	0.383	61.7	0.387	61.3	0.99	1.0
5.	Excel Industries Ltd.	0.606	39.4	0.744	25.6	0.815	18.5
6.	Kopran Ltd.	1.0	0.0	1	0.00	1	0.00
7.	Nagarjuna Fertilizers and Chemicals Ltd.	1.00	0.00	1	0.00	1	0.00
8.	Ranbaxy Laboratories Ltd.	0.743	25.7	1	0.00	0.743	25.7
9.	Southern Petrochemicals Inds. Corpn. Ltd.	1.00	0.00	1	0.00	1	0.00
10.	Sudarshan Chemicals Industries Ltd.	0.557	44.3	0.765	23.5	0.728	27.2
11.	Addisons Paints and Chemicals Ltd.	0.96	4.00	1	0.00	0.960	4.00
12.	Bihar Caustic and Chemical Ltd.	1.00	0.00	1	0.00	1	0.00
Panel B	: Private Foreign Firms						
1.	Abbott India Ltd.	0.859	14.1	0.863	13.7	0.995	0.5
2.	Albright and Wilson Chemicals India Ltd.	0.642	35.8	0.732	26.8	0.877	12.3
3.	Astrazencea Pharma India Ltd.	0.809	19.1	0.826	17.4	0.979	2.1
4.	Colour-Chem Ltd.	0.535	46.5	0.620	38.0	0.863	13.7
5.	Fulford (India) Ltd.	1	0.00	1	0.00	1	0.00
6.	Merck Ltd.	0.543	45.7	0.590	41.0	0.920	8.0
7.	Monsanto India Ltd.	1	0.00	1	0.00	1	0.00
8.	Novartis India Ltd.	1	0.00	1	0.00	1	0.00
9.	Ondeo Nalco India Ltd.	0.586	41.4	0.973	2.7	0.602	39.8
10.	Pfizer India Ltd.	0.684	31.6	0.761	23.9	0.899	10.1
11.	Pharma Healthcare Ltd.	0.739	26.1	0.760	24.0	0.972	2.8
12.	Vanvil Dyes and Chemical Ltd.	1	0.00	1	0.00	1	0.00
Panel C	: Public Sector Firms						
1.	Fertilizer Chemicals, Travancore Ltd.	0.435	56.5	0.456	54.4	0.954	4.6
2.	Fertilizer Corporation of India Ltd.	0.537	46.3	0.631	36.9	0.851	14.9
3.	Hindustan Fertilizer Corpn Ltd.	0.417	58.3	0.749	25.1	0.557	44.3
4.	Hindustan Flurocarbons Ltd.	0.220	78.0	0.440	56.0	0.500	50.0
5.	Hindustan Insecticides Ltd.	0.429	57.1	0.436	56.4	0.984	1.6
6.	Hindustan Organic Chemical Ltd.	0.581	41.9	0.625	37.5	0.930	7.0
7.	Hindustan Salts Ltd.	0.704	29.6	1	0.00	0.704	29.6
8.	Madras Fertilizer Ltd.	0.563	43.7	0.858	14.2	0.656	34.4
9.	National Fertilizer Ltd.	0.592	40.8	0.644	35.6	0.919	8.1
10.	Rashtriya Chemicals and Fertilizer Ltd.	0.921	7.90	1	0.00	0.921	7.9
11.	Sambhar Salts Ltd.	1	0.00	1	0.00	1	0.00
12.	Southern Pesticides Corpn Ltd.	0.460	54.0	0.550	45.0	0.836	16.4
Averag	es						
Whole	Sample	0.713	28.7	0.797	20.3	0.889	11.1
Private	Domestic Firms	0.786	21.4	0.849	15.1	0.924	7.6
Private	Foreign Firms	0.783	21.7	0.844	15.6	0.926	7.4
Public	Sector Firms	0.572	42.8	0.699	30.1	0.818	18.2
Source	Authors' calculations		1				1

Table 1: OTE, PTE and SE Scores for Private Domestic Firms, Private Foreign Firms and Public Sector Firms in the year 1990

from the table that of the 12 firms in the group, four are found to be technically efficient (as they have a score equal to one). These firms jointly define the best practice or efficiency frontier and thus form the reference set for inefficient firms. The input utilization process in these firms is functioning well and the production process is not characterized by any wastage of inputs. In DEA terminology, these firms are called 'peers' and set an example of good operating practices for inefficient firms to emulate. The presence of technically inefficient firms thus indicates the presence of marked deviations among firms from the best practice frontier. These inefficient firms can improve their efficiency by reducing inputs. On the whole, it can be observed that OTIE levels ranged from 4 percent to 61.7 percent among inefficient firms in the year 1990.

4. Decomposition of OTE: PTE and SE

It is to be noted that the OTE measure helps to measure combined inefficiency that is due to both pure technical inefficiency (PTIE) and inefficiency that is due to inappropriate firm size, i.e. scale inefficiency (SIE). However, in contrast to the OTE measure, the PTE measure derived from the BCC model under the assumption of VRS voids the scale effects. Thus, the PTE scores provide that all the inefficiencies directly result from managerial underperformance (i.e. managerial inefficiency) in organizing the firm's inputs. It is again significant to note here that the efficiency scores of the firms rise upon allowing VRS because the BCC model (i.e. a DEA model under VRS assumption) forms a convex hull of intersecting planes which envelops the data point more tightly than the CRS conical hull and provides efficiency scores which are greater than or equal to those obtained using the CCR model (i.e. a DEA model under CRS assumption). In DEA literature, the firms attaining OTE and PTE scores equal to one are known as 'globally efficient' and 'locally efficient' firms respectively. Table I also provides the PTE and SE scores going after the abovementioned criteria. It can be observed that in the year 1990, of the 12 private sector domestic firms, four firms acquired the status of 'globally efficient firms' (OTE score = 1) and 6 firms acquired the status of 'locally efficient firms' (PTE score = 1). Ranbaxy Laboratories Ltd. and Addison Paints and Chemicals Ltd., whose PTE score = 1 and OTE score < 1, indicate that OTIE in these firms is not caused by poor input utilization (i.e. managerial inefficiency) but rather by the operations of the firms with inappropriate scale size. In the remaining six firms (with PTE < 1) managerial inefficiency exists, but of a different magnitude. In these firms, OTIE stems from both PTIE and SIE as indicated by the fact that these firms have both PTE and SE scores less than one. Out of these 6 firms, five firms have PTE scores less than SE scores. This indicates that the inefficiency in resource utilization (i.e. OTIE) in these five firms is mainly attributed to the managerial inefficiency rather than scale inefficiency.

Overall, from the whole group i.e. group I (consisting of private domestic firms) and its PTE and SE measures it can be observed from table I that the OTIE in this group is due to both poor input utilization (i.e. pure technical inefficiency) and failure to operate at the most productive scale size (i.e. scale inefficiency). The average PTE score for these twelve firms is 0.849. This implies that 15.1 percentage points of the 21.4 percent of OTIE is due to poor management practices and selecting incorrect input combinations.

Now while taking the second group of firms, i.e. private firms with foreign ownership, it can be observed from the same table that the OTE (in percentage terms) of the private foreign firms is again characterized by asymmetry, as it ranges from 53.5 percent to 100 percent. The average efficiency score of these MNC's turned out to be 0.783, which is marginally less than the private domestic firms (0.786). This means that the magnitude of the OTIE of private foreign firms in the Indian pharmaceutical industry is 21.7 percent. This finding further suggests that by adopting the best practice technology, these firms again can reduce their inputs of raw material, wages and salaries and gross fixed assets by at least 21.7 percent and still produce the same level of outputs. However, the scope of reduction of inputs varies from firm to firm in this group. In other words, these firms jointly have the scope of producing 1.28 times (i.e. 1/0.783) as much output from the same level of inputs.

Of the total 12 firms in this group only 4 turned out to be technically efficient firms (OTE= 1). However, compared to domestic firms overall inefficiency levels are low, as they ranged from 14.1 percent to 46.5 percent compared to the range of 4 percent to 61.7 percent in the case of private domestic firms in the same year i.e. 1990. While looking at the PTE and SE scores of these firms, it can be observed that exactly the same number of firms and same firms (i.e. four firms) acquired the status of 'globally efficient' firms and 'locally efficient' firms. This means that these four firms - Fulford India Ltd., Monsanto India Ltd., Novartis India Ltd. and Yanvil Dyes and Chemicals Ltd. are technically and managerially efficient. In the case of all the remaining 8 firms, PTE scores are less than SE scores. This means managerial inefficiency rather than scale inefficiency is dominant in these firms. The average PTE scored for these firms is 0.844. This means that 15.6 percent of the 21.7 percent of OTIE is due to poor management practices and the selection of incorrect input combinations.

Now coming to the third group, i.e. public sector pharmaceutical firms in India, it can be observed from table I that out of 12 firms in this category, only one turned out to be 'globally efficient' and 3 can be designated 'locally efficient' firms. Overall OTIE scores ranged between 7.90 percent and 78.0 percent. Of the total 12 firms, in the case of 7 firms PTE scores are less than SE scores. This means that in the majority of the cases managerial inefficiency is greater than scale

No. Name of the firm OTE Score OTE (%) OTE Score OTE (%) Score (%) Score (%) 1. Ambalal Sarabhai Enterprises Ltd. 0.427 57.3 0.429 57.1 0.995 0.5 2. Amrutanjan Ltd. 0.549 45.1 0.617 38.3 0.480 11.0 3. Cipla Ltd. 0.770 21.0 0.857 14.3 0.922 7.8 5. Excel Industries Ltd. 0.438 56.2 0.591 45.1 0.444 15.6 6. Kopran Ltd. 0.52 48.0 0.541 45.9 0.961 3.0 9. Southern Petrochemicals Ltd. 0.621 37.9 1<0.00 0.631 36.2 10. Sudarshar Chemicals Ltd. 0.623 37.5 0.915 48.5 0.971 2.9 1. Abdosons Paints and Chemicals Ltd. 0.422 58.0 0.810 0.838 122 Panel B: Private Foreign Firms 1 0.00 1 </th <th>Panel A</th> <th>: Private Domestic Firms</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>	Panel A	: Private Domestic Firms							
Note Name of the infinition Score (%) Score S	No	Name of the firm	OTE	OTIE	PTE	PTIE	SE	SIE	
1. Ambala Sarabhai Enterprises Ltd. 0.427 57.3 0.429 57.1 0.929 0.51 2. Amutanjan Ltd. 0.76 22.4 0.000 0.776 22.4 4. Deepak Fertilizer and Petrochemicals Corpn. Ltd. 0.790 22.4 0.000 0.776 22.4 5. Excel Industries Ltd. 0.438 56.2 0.519 48.1 0.841 45.9 6. Kopran Ltd. 0.621 37.9 1 0.00 1.6 0.00 1.6 0.00 1.8 0.00 0.621 37.9 9. Southern Petrochemicals Industries Ltd. 0.500 50.0 0.515 48.5 0.971 8.20 1. Addiosno Paints and Chemicals Itd. 0.422 7.5 0.915 48.5 0.80 0.83 3.62 12. Bhar Caustic and Chemicals India Ltd. 0.422 7.5 0.915 48.5 0.855 1.5 0.866 1.4 4. Colour-Chem Ltd. 0.475 54.3 0.900 1.000 1 0.000 1 0.000 1 0.000	NO.	Name of the firm	Score	(%)	Score	(%)	Score	(%)	
2. Amrutanjan Itd. 0.549 45.1 0.617 38.3 0.890 11.0 3. Cipla Itd. 0.76 22.4 1 0.00 0.776 22.4 4. Deepak Fertilizer and Petrochemicals Corpn. Ltd. 0.70 22.4 0.0857 14.3 0.922 7.8 5. Excel Industries Ltd. 0.428 62.2 48.0 0.541 45.9 0.961 3.9 7. Nagarjuna Fertilizers and Chemicals Ltd. 0.61 37.9 1 0.00 1.1 0.00 0.611 37.9 9. Southern Petrochemicals Industries Ltd. 0.612 37.9 1.1 0.00 0.815 18.5 10. Sudarshan Chemicals Itd. 0.500 50.15 48.5 0.971 2.2 11. Addisons Paints and Chemicals Itd. 0.520 27.5 0.915 8.50 0.638 36.2 12. Bihar Caustic and Chemicals Itd. 0.520 27.5 0.915 8.50 0.618 36.2 12. Abbott India Itd. 0.42 58.8 0.511 48.90 0.865 </td <td>1.</td> <td>Ambalal Sarabhai Enterprises Ltd.</td> <td>0.427</td> <td>57.3</td> <td>0.429</td> <td>57.1</td> <td>0.995</td> <td>0.5</td>	1.	Ambalal Sarabhai Enterprises Ltd.	0.427	57.3	0.429	57.1	0.995	0.5	
3. Cipla Ltd. 0.776 22.4 1 0.00 0.776 22.4 4. Degape Fertilizer and Petrochemicals Corpn. Ltd. 0.780 21.0 0.857 14.3 0.922 7.8 5. Excel Industries Ltd. 0.438 56.2 0.519 44.1 0.844 15.6 6. Kopran Ltd. 0.52 48.0 0.541 45.9 0.961 3.9 7. Nagarjuna Fertilizers and Chemicals Ltd. 0.621 37.9 1 0.00 0.621 37.9 9. Southern Petrochemicals Industries Ltd. 0.625 37.5 0.915 8.85 0.871 12.2 11. Addisons Paints and Chemicals Ltd. 0.626 37.5 0.915 8.85 0.638 66.2 12. Bihar Caustic and Chemicals Ltd. 0.627 37.4 0.800 1.0 0.00 1 0.00 1 0.00 1.0 0.878 12.2 Partitizer cong Firms 11. Adbiost India Ltd. 0.442 55.8 0.511 44.9 0.865 13.5 0.988 1.1.	2.	Amrutanjan Ltd.	0.549	45.1	0.617	38.3	0.890	11.0	
4. Deepak Fertilizer and Petrochemicals Corpn. Ltd. 0.780 21.0 0.857 14.3 0.922 7.8 5. Excel Industries Ltd. 0.438 56.2 0.519 48.1 0.60 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1.0 0.00 1.0 0.00 1.0 0.00 1.0 0.00 1.0 0.00 0.611 3.79 1.0 0.00 0.621 3.79 9. Southern Petrochemicals Ind. 0.621 3.79 0.00 0.515 48.5 0.071 2.50 10. Sudarshan Chemicals Industrist Ind. 0.002 28.0 0.820 18.0 0.878 12.2 11. Addisons Paints and Chemicals India Ltd. 0.702 28.0 0.820 18.0 0.865 13.5 12. Albright and Wilson Chemicals India Ltd. 0.442 55.8 0.511 4.80 0.865 13.5 1.35 3. Astarencea Pharma India Ltd. 0.478 52.2 0.485 51.5 0.988 </td <td>3.</td> <td>Cipla Ltd.</td> <td>0.776</td> <td>22.4</td> <td>1</td> <td>0.00</td> <td>0.776</td> <td>22.4</td>	3.	Cipla Ltd.	0.776	22.4	1	0.00	0.776	22.4	
5. Excel Industries Ltd. 0.438 56.2 0.519 48.1 0.644 15.5 6. Kopran Ltd. 1 0.000 1 0.000 1.8 0.621 37.9 7. Nagarjuna Fertilizers and Chemicals Ltd. 0.621 37.9 0.000 0.621 37.9 9. Southern Petrochemicals Industries Ltd. 0.625 37.5 0.0155 48.5 0.971 2.9 1. Addisons Paints and Chemicals Ltd. 0.626 37.5 0.0155 48.5 0.971 2.9 Protect Foreign Firms 1. Abbott India Ltd. 1 0.00	4.	Deepak Fertilizer and Petrochemicals Corpn. Ltd.	0.790	21.0	0.857	14.3	0.922	7.8	
6. Kopran Ltd. 0.52 48.0 0.541 45.9 0.961 3.9 7. Nagarjuna Fertilizers and Chemicals Ltd. 0.621 37.9 1 0.00 1 0.00 8. Ranbaxy Laboratories Ltd. 0.815 18.5 1.1 0.00 0.621 37.9 9. Southern Petrochemicals Industries Ltd. 0.625 37.5 0.915 8.50 0.638 36.2 1. Addisons Paints and Chemicals Ltd. 0.702 28.0 0.800 1.0 0.0878 12.2 Private Foreign Firms 1. Abbort India Ltd. 0.42 55.8 0.511 48.9 0.966 1.4 4. Colour-Chem Ltd. 0.471 4.00 1 0.00 1 0.00 5. Fulford (India) Ltd. 0.473 54.3 0.465 53.5 0.988 1.7 5. Fulford (India) Ltd. 0.473 4.41 0.073 4.27 0.589 4.11 0.733 2.67 0.797 30.3 6. Merck Ltd. 0.573 4.27	5.	Excel Industries Ltd.	0.438	56.2	0.519	48.1	0.844	15.6	
7. Nagarjuna Fertilizers and Chemicals Itd. 0.61 0.00 1 0.00 0.021 37.9 8. Ranbary Laboratorise Itd. 0.815 18.5 1 0.00 0.815 18.5 10. Sudarshan Chemicals Industries Ltd. 0.625 37.5 0.915 8.50 0.638 36.2 11. Addisons Paints and Chemicals Itd. 0.626 37.5 0.915 8.50 0.638 36.2 12. Bihar Caustic and Chemicals Itd. 0.621 37.9 0.920 18.0 0.820 18.0 0.828 18.2 Panel B-Private Foreign Firms 1. Abbott India Itd. 1 0.00 1 0.00 1 0.00 2. Abbright and Wilson Chemicals India Itd. 0.447 55.8 0.511 48.9 0.865 13.5 3. Astrzencee Pharma India Itd. 0.447 55.43 0.465 53.5 0.983 1.7 5. Fulford (India) Itd. 0.573 42.7 0.589 41.1 0.00 1 0.00 1 0.00 1 0.00	6.	Kopran Ltd.	0.52	48.0	0.541	45.9	0.961	3.9	
8. Nonbay Laboratories Ltd. 0.021 3/39 1 0.000 0.021 3/39 9. Southern Petrochemicals India S. Corpn. Ltd. 0.815 18.5 1 0.000 0.815 18.5 10. Sudarshan Chemicals India Str. 0.620 3/30 0.510 0.515 48.5 0.971 2.9 11. Addisons Paints and Chemicals Ltd. 0.620 18.0 0.828 18.2 Panel E: Private Foreign Firms visuate foreign Firms	/.	Nagarjuna Fertilizers and Chemicals Ltd.	1	0.00	1	0.00	1	0.00	
9. Southern Performations Corp. Ltd. 0.813 16.3 1.613 1.000 0.813 16.35 10. Sudarshan Chemicals Industricut 0.620 500 500 0.515 48.5 0.971 2.9 11. Addisons Paints and Chemicals Ltd. 0.620 37.5 0.915 8.50 0.638 16.2 Panel B: Private Foreign Firms . . 0.000 1 0.000 1 0.00 1	8.	Ranbaxy Laboratories Ltd.	0.621	37.9	1	0.00	0.621	37.9	
10. Judarshair Chemicals Itd. 0.500 30.0 50.315 44.35 0.571 2.39 11. Addisons Paints and Chemicals Itd. 0.625 37.5 0.915 8.50 0.638 36.2 12. Bihar Caustic and Chemicals Itd. 0.720 28.0 0.820 18.0 0.878 12.2 Panel B: Private Foreign Firms 1. Abbott India Itd. 0.442 55.8 0.511 48.9 0.865 13.5 3. Astrazencea Pharma India Itd. 0.474 52.2 0.485 51.5 0.986 1.4 4. Colour-Chem Itd. 0.457 54.3 0.465 53.5 0.983 1.7 5. Fulford (India) Itd. 1 0.00 1 0.00 1 0.00 6. Merck Ltd. 0.573 42.7 0.589 41.1 0.903 1 0.00 7. Monsanto India Itd. 0.839 16.1 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1	9.	Southern Petrochemicals Inductries Ltd	0.815	18.5	0.515	0.00	0.815	18.5	
11. Addison's rain's and Chemical Ltd. 0.020 23.7.3 0.913 8.30 0.038 36.2 12. Bihar Caustic and Chemical Ltd. 0.720 28.0 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.820 0.825 1.5 0.000 1 0.	10.	Sudarshan Chemicals Industries Ltd.	0.500	50.0	0.515	48.5	0.971	2.9	
12. Differential Ltd. 1 0.020 1.8.0 0.037 12.4.2 Panel B: Private Foreign Firms 1 0.00 1 0.00 1 0.00 1 0.00 2. Albright and Wilson Chemicals India Ltd. 0.442 55.8 0.511 48.9 0.865 13.5 3. Astraencea Pharma India Ltd. 0.472 5.84 0.465 53.5 0.986 1.4 4. Colour-Chem Ltd. 0.457 54.3 0.465 53.5 0.986 1.7 5. Fulford (India) Ltd. 0.573 42.7 0.589 41.1 0.00 1 0.00 6. Merck Ltd. 0.533 40.7 0.589 41.1 0.00 1 0.00 8. Novartis India Ltd. 0.584 41.6 0.733 2.7 0.942 5.8 10. Phirer India Ltd. 0.688 31.2 0.704 2.0 0.942 5.8 11. Pharma Healthcare Ltd. 0.717 28.3 0.724 2.7.6 0.990 1.0 12. Va	11.	Addisons Paints and Chemical Ltd	0.025	37.5	0.915	8.50	0.038	30.2	
1. Abbott India Ltd. 1 0.00 1 0.00 2. Albright and Wilson Chemicals India Ltd. 0.442 55.8 0.511 48.9 0.865 13.5 3. Astrazencea Pharma India Ltd. 0.447 55.8 0.511 48.9 0.865 13.5 3. Astrazencea Pharma India Ltd. 0.447 55.4 0.465 53.5 0.988 1.7 5. Fulford (India) Ltd. 1 0.00 1 0.00 1 0.00 6. Merck Ltd. 0.573 42.7 0.589 41.1 0.973 2.7 7. Monsanto India Ltd. 0.839 16.1 1 0.00 1.000 1.000 8. Novartis India Ltd. 0.839 16.1 1 0.00 0.839 16.1 9. Ondeo Nalco India Ltd. 0.584 41.6 0.733 26.7 0.797 30.3 10. Phirma Healthcare Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.717 28.3	Panel B	• Private Foreign Firms	0.720	20.0	0.820	18.0	0.878	12.2	
1. Abbd(1mba Ltd. 0.42 55.8 0.511 48.9 0.865 13.5 3. Astrazencea Pharma India Ltd. 0.478 55.8 0.485 51.5 0.986 1.4 4. Colour-Chem Ltd. 0.477 54.3 0.465 53.5 0.983 1.7 5. Fulford (India) Ltd. 1 0.00 1 0.00 1 0.00 6. Merck Ltd. 0.573 42.7 0.589 41.1 0.973 2.7 7. Monsanto India Ltd. 0.819 16.1 0.00 1 0.00 1 0.00 8. Novartis India Ltd. 0.584 41.6 0.733 26.7 0.797 30.3 10. Pfizer India Ltd. 0.688 31.2 0.730 27.4 0.76 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.612 3.8 0.704 29.6 0.656 34.4 2. Fertilizer Chemicals, Travancore Ltd. 0.212 78.8 0.744 25.4 0.370 63.0 3. Hindustan F	1		1	0.00	1	0.00	1	0.00	
2. Abdgit and Wisdit Cleffinds India Ltd. 0.472 3.03 0.511 40.35 0.030 13.1 3. Astrazencea Pharma India Ltd. 0.478 52.2 0.485 51.5 0.986 1.4 4. Colour-Chem Ltd. 0.457 54.3 0.465 53.5 0.983 1.7 5. Fulford (India) Ltd. 0.573 42.7 0.509 41.1 0.900 1 0.000 6. Merck Ltd. 0.533 42.7 0.599 41.1 0.973 2.7 7. Monsanto India Ltd. 0.531 41.6 0.733 2.67 0.797 30.3 10. Pfizer India Ltd. 0.688 31.2 0.730 27.0 0.942 5.8 11. Pharma Healthcare Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.671 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.717 28.3 0.724 2.64 0.363.0 13. Hindusta	1. 2	Albright and Wilson Chemicals India Ltd	0.442	55.8	0.511	18.0	0.865	13.5	
3. Additional functional frammational frammationa	2.	Astrazoncoa Pharma India Ltd	0.442	52.2	0.311	51.5	0.805	14	
S. Fulford (India Ltd. 1 0.00 1 1.00 1 1.00 1 1.00 1 1.00 1 1.00 1 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.	<u>J</u> .	Colour-Chem Ltd	0.470	54.3	0.465	53.5	0.983	1.7	
a. Industry Lat. 0.573 42.7 0.589 41.1 0.973 2.7 7. Monsanto India Ltd. 1 0.00 1 0.00 1 0.00 8. Novartis India Ltd. 0.839 16.1 1 0.00 0.839 16.1 9. Ondeo Nalco India Ltd. 0.688 31.2 0.733 22.7 0.797 30.3 10. Pfizer India Ltd. 0.688 31.2 0.733 27.0 0.942 5.8 11. Pharma Healthcare Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.612 3.8 0.74 2.6 0.656 3.44 2. Fertilizer Chemicals, Travancore Ltd. 0.462 5.3.8 0.704 2.6 0.656 3.44 2. Fertilizer Corporation of India Ltd. 0.212 78.8 0.214 78.6 0.991 0.9 3. Hindustan Fert	5	Eulford (India) Ltd	1	0.00	1	0.00	1	0.00	
7. Monsanto India Ltd. 1 0.00 1 0.00 1 0.00 8. Novartis India Ltd. 0.839 16.1 1 0.00 0.839 16.1 9. Ondeo Nalco India Ltd. 0.584 41.6 0.733 26.7 0.797 30.3 10. Pfizer India Ltd. 0.688 31.2 0.730 27.0 0.942 5.8 11. Pharma Healthcare Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.692 30.8 0.828 17.2 0.836 16.4 Partilizer Chemicals, Travancore Ltd. 0.612 7.88 0.214 7.86 0.991 0.9 3. Hindustan Fertilizer Corpon Ltd. 0.212 7.88 0.214 7.86 0.991 0.9 3. Hindustan Fertilizer Chemical Ltd. 0.226 7.24 0.746 25.4 0.370 63.0 4. Hindustan Furdizer Ltd. 0.329 67.1 0.330 67.0 0.997 0.3 7. Hindust	6.	Merck I td.	0.573	42.7	0.589	41.1	0.973	2.7	
8. Novartis India Ltd. 0.839 16.1 1 0.00 0.839 16.1 9. Ondeo Nalco India Ltd. 0.584 41.6 0.733 26.7 0.797 30.3 10. Pfizer India Ltd. 0.688 31.2 0.730 27.0 0.942 5.8 11. Pharma Healthcare Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.692 30.8 0.828 17.2 0.836 16.4 Pathic Sector Firms 1. Fertilizer Compration of India Ltd. 0.462 53.8 0.704 29.6 0.656 34.4 2. Fertilizer Corporation of India Ltd. 0.212 78.8 0.214 78.6 0.991 0.9 3. Hindustan Fullizer Corput. 0.276 72.4 0.746 25.4 0.370 63.0 4. Hindustan Insecticides Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Organic Chemical Ltd. 0.329 67.1 0.300 67.0	7.	Monsanto India Ltd.	1	0.00	1	0.00	1	0.00	
9. Ondeo Nalco India Ltd. 0.584 41.6 0.733 26.7 0.797 30.3 10. Pfizer India Ltd. 0.688 31.2 0.730 27.0 0.942 5.8 11. Pharma Healthcare Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.672 30.8 0.828 17.2 0.836 16.4 Fertilizer Chemicals, Travancore Ltd. 0.462 53.8 0.704 29.6 0.656 34.4 2. Fertilizer Chemicals, Travancore Ltd. 0.212 78.8 0.214 78.6 0.991 0.9 3. Hindustan Fertilizer Corpn Ltd. 0.276 72.4 0.746 25.4 0.370 63.0 4. Hindustan Fertilizer Chemical Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Salts Ltd. 0.329 67.1 0.330 67.0 0.997 0.3	8.	Novartis India Ltd.	0.839	16.1	1	0.00	0.839	16.1	
10. Pfizer India Ltd. 0.688 31.2 0.730 27.0 0.942 5.8 11. Pharma Healthcare Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.692 30.8 0.82 17.2 0.836 16.4 Parel C: Public Sector Firms Using Sector Firms 1. Fertilizer Chemicals, Travancore Ltd. 0.462 53.8 0.704 29.6 0.656 34.4 2. Fertilizer Corporation of India Ltd. 0.212 78.8 0.214 78.6 0.991 0.9 3. Hindustan Fertilizer Corpn Ltd. 0.226 72.4 0.746 25.4 0.370 63.0 4. Hindustan Flurocarbons Ltd. 0.302 63.8 0.663 33.7 0.546 45.4 5. Hindustan Organic Chemical Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Salts Ltd. 0.325 67.1 0.330 67.0 0.997 0.3 7. Hindustan Salts Ltd.	9.	Ondeo Nalco India Ltd.	0.584	41.6	0.733	26.7	0.797	30.3	
11. Pharma Healthcare Ltd. 0.717 28.3 0.724 27.6 0.990 1.0 12. Vanvil Dyes and Chemical Ltd. 0.692 30.8 0.828 17.2 0.836 16.4 Panel C: Public Sector Firms 1. Fertilizer Chemicals, Travancore Ltd. 0.462 53.8 0.704 29.6 0.656 34.4 2. Fertilizer Corporation of India Ltd. 0.212 78.8 0.214 78.6 0.991 0.9 3. Hindustan Fertilizer Corpor Ltd. 0.276 72.4 0.746 25.4 0.370 63.0 4. Hindustan Flurocarbons Ltd. 0.362 63.8 0.663 33.7 0.546 45.4 5. Hindustan Insecticides Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Organic Chemical Ltd. 0.329 67.1 0.330 67.0 0.997 0.3 7. Hindustan Salts Ltd. 0.325 47.5 0.951 4.9 0.522 8. Madras Fertilizer Ltd. 0.525 47.5 0.951 <td< td=""><td>10.</td><td>Pfizer India Ltd.</td><td>0.688</td><td>31.2</td><td>0.730</td><td>27.0</td><td>0.942</td><td>5.8</td></td<>	10.	Pfizer India Ltd.	0.688	31.2	0.730	27.0	0.942	5.8	
12. Vanvil Dyes and Chemical Ltd. 0.692 30.8 0.828 17.2 0.836 16.4 Panel C: Public Sector Firms 1. Fertilizer Chemicals, Travancore Ltd. 0.462 53.8 0.704 29.6 0.656 34.4 2. Fertilizer Corporation of India Ltd. 0.212 78.8 0.214 78.6 0.991 0.9 3. Hindustan Fertilizer Corpn Ltd. 0.276 72.4 0.746 25.4 0.370 63.0 4. Hindustan Flurocarbons Ltd. 0.362 63.8 0.663 33.7 0.546 45.4 5. Hindustan Insecticides Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Organic Chemical Ltd. 0.329 67.1 0.330 67.0 0.997 0.3 7. Hindustan Salts Ltd. 1 0.00 1 0.00 1 0.00 8. Madras Fertilizer Ltd. 0.729 27.1 1 0.00 1.2 0.522 44.3 9. National Fertilizer Ltd. 0.729 27.1	11.	Pharma Healthcare Ltd.		28.3	0.724	27.6	0.990	1.0	
Panel C: Putilize Chemicals, Travancore Ltd.0.46253.80.70429.60.65634.42.Fertilizer Corporation of India Ltd.0.21278.80.21478.60.9910.93.Hindustan Fertilizer Corpn Ltd.0.27672.40.74625.40.37063.04.Hindustan Flurocarbons Ltd.0.36263.80.66333.70.54645.45.Hindustan Organic Chemical Ltd.0.32967.10.33067.00.9970.36.Hindustan Organic Chemical Ltd.0.32967.10.33067.00.9970.37.Hindustan Salts Ltd.10.0010.0010.010.9978.Madras Fertilizer Ltd.0.46353.70.86213.80.53746.39.National Fertilizer Ltd.0.52547.50.9514.90.55244.810.Rashtriya Chemicals and Fertilizer Ltd.0.72927.110.0010.0011.Sambhar Salts Ltd.10.0010.010.09727.111.Sambhar Salts Ltd.10.0010.0010.0012.soutern Pesticides Corpn Ltd.0.110.0010.0010.0013.Soutern Pesticides Corpn Ltd.0.110.0010.0010.00114.Soutern Pesticides Corpn Ltd.0.110.0210.0010.00	12.	Vanvil Dyes and Chemical Ltd.	0.692	30.8	0.828	17.2	0.836	16.4	
1. Fertilizer Chemicals, Travancore Ltd. 0.462 53.8 0.704 29.6 0.656 34.4 2. Fertilizer Corporation of India Ltd. 0.212 78.8 0.214 78.6 0.991 0.9 3. Hindustan Fertilizer Corp Ltd. 0.267 72.4 0.746 25.4 0.370 63.0 4. Hindustan Flurocarbons Ltd. 0.362 63.8 0.663 33.7 0.546 45.4 5. Hindustan Organic Chemical Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Organic Chemical Ltd. 0.329 67.1 0.330 67.0 0.997 0.3 7. Hindustan Salts Ltd. 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1 0.00 1	Panel C	: Public Sector Firms							
2. Fertilizer Corporation of India Ltd. 0.212 78.8 0.214 78.6 0.991 0.9 3. Hindustan Fertilizer Corpn Ltd. 0.276 72.4 0.746 25.4 0.370 63.0 4. Hindustan Flurocarbons Ltd. 0.362 63.8 0.663 33.7 0.546 45.4 5. Hindustan Insecticides Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Organic Chemical Ltd. 0.303 69.7 0.300 67.0 0.997 0.3 7. Hindustan Salts Ltd. 1 0.00 1 0.00 1 0.00 8. Madras Fertilizer Ltd. 0.463 53.7 0.862 13.8 0.537 46.3 9. National Fertilizer Ltd. 0.525 47.5 0.951 4.9 0.522 44.8 10. Rashtriya Chemicals and Fertilizer Ltd. 0.729 27.1 1 0.00 1 0.00 11. Sambhar Salts Ltd. 1 0.00 1 0.00 1 0.00 1 0.00	1.	Fertilizer Chemicals, Travancore Ltd.	0.462	53.8	0.704	29.6	0.656	34.4	
3. Hindustan Fertilizer Corpn Ltd. 0.276 72.4 0.746 25.4 0.370 63.0 4. Hindustan Flurocarbons Ltd. 0.362 63.8 0.663 33.7 0.546 45.4 5. Hindustan Insecticides Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Organic Chemical Ltd. 0.329 67.1 0.330 67.0 0.997 0.3 7. Hindustan Salts Ltd. 1 0.00 1 0.00 1 0.00 8. Madras Fertilizer Ltd. 0.463 53.7 0.862 13.8 0.537 46.3 9. National Fertilizer Ltd. 0.525 47.5 0.951 4.9 0.522 44.8 10. Rashtriya Chemicals and Fertilizer Ltd. 0.729 27.1 1 0.00 0.729 27.1 11. Sambhar Salts Ltd. 1 0.00 1 0.00 1 0.00 12. Southern Pesticides Corpn Ltd. 0.147 85.3 0.737 26.3 0.199 80.1 M	2.	Fertilizer Corporation of India Ltd.	0.212	78.8	0.214	78.6	0.991	0.9	
4. Hindustan Flurocarbons Ltd. 0.362 63.8 0.663 33.7 0.546 45.4 5. Hindustan Insecticides Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Organic Chemical Ltd. 0.329 67.1 0.300 67.0 0.997 0.3 7. Hindustan Salts Ltd. 1 0.00 1 0.00 1 0.0 8. Madras Fertilizer Ltd. 0.463 53.7 0.862 13.8 0.537 46.3 9. National Fertilizer Ltd. 0.463 53.7 0.862 13.8 0.537 46.3 10. Rashtriya Chemicals and Fertilizer Ltd. 0.525 47.5 0.951 4.9 0.552 44.8 10. Rashtriya Chemicals and Fertilizer Ltd. 0.729 27.1 1 0.00 1.2 0.00 1.4 0.00 1.4 0.00 12. Southern Pesticides Corpn Ltd. 0.147 85.3 0.737 26.3 0.199 80.1 Average 0.648 35.2	3.	Hindustan Fertilizer Corpn Ltd.	0.276	72.4	0.746	25.4	0.370	63.0	
5. Hindustan Insecticides Ltd. 0.303 69.7 0.305 69.5 0.993 0.7 6. Hindustan Organic Chemical Ltd. 0.329 67.1 0.300 67.0 0.997 0.3 7. Hindustan Salts Ltd. 1 0.00 1 0.00 1 0.00 8. Madras Fertilizer Ltd. 0.463 53.7 0.862 13.8 0.537 46.3 9. National Fertilizer Ltd. 0.525 47.5 0.951 4.9 0.552 44.8 10. Rashtriya Chemicals and Fertilizer Ltd. 0.729 27.1 1 0.00 1 0.00 11. Sambhar Salts Ltd. 1 0.00 1 0.00 1 0.00 12. Southern Pesticides Corpn Ltd. 0.147 85.3 0.737 26.3 0.199 80.1 Average Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 <td< td=""><td>4.</td><td>Hindustan Flurocarbons Ltd.</td><td>0.362</td><td>63.8</td><td>0.663</td><td>33.7</td><td>0.546</td><td>45.4</td></td<>	4.	Hindustan Flurocarbons Ltd.	0.362	63.8	0.663	33.7	0.546	45.4	
6. Hindustan Organic Chemical Ltd. 0.329 67.1 0.330 67.0 0.997 0.3 7. Hindustan Salts Ltd. 1 0.00 1 0.00 1 0.0 8. Madras Fertilizer Ltd. 0.463 53.7 0.862 13.8 0.537 46.3 9. National Fertilizer Ltd. 0.525 47.5 0.951 4.9 0.552 44.8 10. Rashtriya Chemicals and Fertilizer Ltd. 0.729 27.1 1 0.00 1 0.00 11. Sambhar Salts Ltd. 1 0.00 1 0.00 1 0.00 12. Southern Pesticides Corpn Ltd. 0.147 85.3 0.737 26.3 0.199 80.1 Average Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.648 35.6 0.705 24.5 0.934 6.6 <td colspa<="" td=""><td>5.</td><td>Hindustan Insecticides Ltd.</td><td>0.303</td><td>69.7</td><td>0.305</td><td>69.5</td><td>0.993</td><td>0.7</td></td>	<td>5.</td> <td>Hindustan Insecticides Ltd.</td> <td>0.303</td> <td>69.7</td> <td>0.305</td> <td>69.5</td> <td>0.993</td> <td>0.7</td>	5.	Hindustan Insecticides Ltd.	0.303	69.7	0.305	69.5	0.993	0.7
7. Hindustan Salts Ltd. 1 0.00 1 0.00 1 0.00 8. Madras Fertilizer Ltd. 0.463 53.7 0.862 13.8 0.537 46.3 9. National Fertilizer Ltd. 0.525 47.5 0.951 4.9 0.552 44.8 10. Rashtriya Chemicals and Fertilizer Ltd. 0.729 27.1 1 0.00 0.729 27.1 11. Sambhar Salts Ltd. 1 0.00 1 0.00 1 0.00 12. Southern Pesticides Corpn Ltd. 0.147 85.3 0.737 26.3 0.199 80.1 Average Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	6.	Hindustan Organic Chemical Ltd.	0.329	67.1	0.330	67.0	0.997	0.3	
8. Madras Fertilizer Ltd. 0.463 53.7 0.862 13.8 0.537 46.3 9. National Fertilizer Ltd. 0.525 47.5 0.951 4.9 0.552 44.8 10. Rashtriya Chemicals and Fertilizer Ltd. 0.729 27.1 1 0.00 0.729 27.1 11. Sambhar Salts Ltd. 1 0.00 1 0.00 1 0.00 12. Southern Pesticides Corpn Ltd. 0.147 85.3 0.737 26.3 0.199 80.1 Average Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.648 35.2 0.768 23.2 0.863 13.7 Public Sector Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	7.	Hindustan Salts Ltd.	1	0.00	1	0.00	1	0.0	
9. National Fertilizer Ltd. 0.525 47.5 0.951 4.9 0.552 44.8 10. Rashtriya Chemicals and Fertilizer Ltd. 0.729 27.1 1 0.00 0.729 27.1 11. Sambhar Salts Ltd. 1 0.00 1 0.00 1 0.00 12. Southern Pesticides Corpn Ltd. 0.147 85.3 0.737 26.3 0.199 80.1 Average Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	8.	Madras Fertilizer Ltd.	0.463	53.7	0.862	13.8	0.537	46.3	
10. Rashtriya Chemicals and Perfulzer Ltd. 0.729 27.1 1 0.00 0.729 27.1 11. Sambhar Salts Ltd. 1 0.00 1 0.00 1 0.00 12. Southern Pesticides Corpn Ltd. 0.147 85.3 0.737 26.3 0.199 80.1 Average Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	9.	National Fertilizer Ltd.	0.525	47.5	0.951	4.9	0.552	44.8	
11. Sambhar Saits Etd. 1 0.00 0.19 80.1 Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Public Sector Firms 0.706 29.4 0.755 24.5 0.934 6.6 Sector Firms 0.444 51.6 0.709 29.1 0.714 28.6	10.	Rashtriya Chemicais and Fertilizer Ltd.	0.729	27.1	1	0.00	0.729	27.1	
Averages 0.147 85.3 0.737 28.3 0.199 80.1 Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.5	11.	Sambnar Sails Liu.	0.147	0.00	0 7 2 7	0.00	0.100	0.00	
Whole Sample 0.613 38.7 0.744 25.6 0.837 16.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	12. Averag		0.147	05.5	0.737	20.3	0.199	80.1	
Whole Sample 0.613 36.7 0.744 23.6 0.637 10.3 Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	Whole	co 'emula	0.612	20.7	0.744	25.6	0.027	16.2	
Private Domestic Firms 0.648 35.2 0.768 23.2 0.863 13.7 Private Foreign Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	whole s	Dampie	0.013	20.7	0.744	25.0	0.657	10.5	
Private Foreign Firms 0.706 29.4 0.755 24.5 0.934 6.6 Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	Private		0.648	35.2	0.768	23.2	0.863	13./	
Public Sector Firms 0.484 51.6 0.709 29.1 0.714 28.6	Private	roreign rirms	0.706	29.4	0.755	24.5	0.934	0.6	
	Public	ector Firms	0.484	51.6	0.709	29.1	0./14	28.6	

Table 2: OTE, PTE and SE Scores for Private Domestic Firms, Private Foreign Firms and Public Sector Firms in the year 2000

inefficiency. The average PTE scores in this case are 0.699. This means that of the total 42.8 percent inefficiency, 30.1 percent are due to poor management skills in the year 1990. The average scale inefficiency score in the case of public sector firms turned out to be 0.818 in the year 1990.

Table 2 of the study depicts the overall technical efficiency, pure technical efficiency and scale efficiency scores of private domestic firms, private foreign firms and public sector firms of the Indian pharmaceutical industry

for the year 2000 (representing the post reform period). A comparative analysis for the years 1990 to 2000 shows that average OTE scores have decreased in the case of all three groups in the post reform period. The scores from the year 2000 for private domestic firms, private foreign firms and public sector firms are 0.648, 0.706 and 0.484, respectively, as compared to 0.786, 0.783 and 0.572, respectively, in the year 1990. The highest decrease in efficiency is in the case of private domestic firms followed by public sector firms and private foreign firms. This

Panel A: Private Domestic Firms								
No	Name of the firm	OTE	OTIE	PTE	PTIE	SE	SIE	
NO.		Score	(%)	Score	(%)	Score	(%)	
1.	Ambalal Sarabhai Enterprises Ltd.	0.717	28.3	0.202	79.8	0.847	15.3	
2.	Amrutanjan Ltd.	0.352	64.8	0.504	49.6	0.698	30.2	
3.	Cipla Ltd.	0.945	5.5	1	0.00	0.945	5.5	
4.	Deepak Fertilizer and Petrochemicals Corpn. Ltd.	0.575	42.5	0.575	42.5	1	0.00	
5.	Excel Industries Ltd.	0.402	59.8	0.437	56.3	0.920	8.0	
6.	Kopran Ltd.	0.480	52.0	0.564	43.6	0.851	14.9	
7.	Nagarjuna Fertilizers and Chemicals Ltd.	1	0.00	1	0.00	1	0.00	
8.	Ranbaxy Laboratories Ltd.	0.839	16.1	1	0.00	0.839	16.1	
9.	Southern Petrochemicals Inds. Corpn. Ltd.	0.653	34.7	0.681	31.9	0.959	4.1	
10.	Sudarshan Chemicals Industries Ltd.	0.599	40.1	0.610	39.0	0.982	1.8	
11.	Addisons Paints and Chemicals Ltd.	0.360	64.0	1	0.00	0.360	64.0	
12.	Bihar Caustic and Chemical Ltd.	0.519	48.1	0.662	33.8	0.784	21.6	
Panel B	: Private Foreign Firms							
1.	Abbott India Ltd.	1	0.00	1	0.00	1	0.00	
2.	Albright and Wilson Chemicals India Ltd.	0.741	25.9	0.912	8.8	0.813	18.7	
3.	Astrazencea Pharma India Ltd.	0.379	62.1	0.398	60.2	0.952	4.8	
4.	Colour-Chem Ltd.	0.432	56.8	0.433	56.7	0.998	0.20	
5.	Fulford (India) Ltd.	1	0.00	1	0.00	1	0.00	
6.	Merck Ltd.	0.599	40.1	0.602	39.8	0.995	0.50	
7.	Monsanto India Ltd.	1	0.00	1	0.00	1	0.00	
8.	Novartis India Ltd.	1	0.00	1	0.00	1	0.00	
9.	Ondeo Nalco India Ltd.	0.558	44.2	0.717	28.3	0.778	22.2	
10.	Pfizer India Ltd.	0.499	50.1	0.702	29.8	0.711	28.9	
11.	Pharma Healthcare Ltd.	0.236	76.4	0.445	55.5	0.530	47.0	
12.	Vanvil Dyes and Chemical Ltd.	0.451	54.9	0.693	30.7	0.651	34.9	
Panel C: Public Sector Firms								
1.	Fertilizer Chemicals, Travancore Ltd.	0.323	67.7	0.398	60.2	0.812	18.8	
2.	Fertilizer Corporation of India Ltd.	0.068	93.2	1	0.00	0.068	93.2	
3.	Hindustan Fertilizer Corpn Ltd.	0.213	78.7	0.259	74.1	0.822	17.8	
4.	Hindustan Flurocarbons Ltd.	0.25	75.0	0.614	38.6	0.407	59.3	
5.	Hindustan Insecticides Ltd.	0.194	80.6	0.213	78.7	0.911	8.9	
6.	Hindustan Organic Chemical Ltd.	0.392	60.8	0.393	60.7	0.997	0.3	
7.	Hindustan Salts Ltd.	0.377	62.3	1	0.00	0.377	62.3	
8.	Madras Fertilizer Ltd.	1	0.00	1	0.00	1	0.00	
9.	National Fertilizer Ltd.	0.876	12.4	1	0.00	0.876	12.4	
10.	Rashtriya Chemicals and Fertilizer Ltd.	0.839	16.1	1	0.00	0.839	16.1	
11.	Sambhar Salts Ltd.	1	0.00	1	0.00	1	0.00	
12.	Southern Pesticides Corpn Ltd.	0.028	97.2	1	0.00	0.028	97.2	
Average	25							
Whole S	Sample	0.565	43.5	0.723	27.7	0.799	20.1	
Private	Domestic Firms	0.575	42.5	0.686	31.4	0.849	15.1	
Private	Foreign Firms	0.658	34.2	0.742	25.8	0.869	23.1	
Public S	Sector Firms	0.463	53.7	0.740	26.0	0.678	32.2	
Source: Authors' calculations								

Table 3: OTE, PTE and SE Scores for Private Domestic Firms, Private Foreign Firms and Public Sector Firms in the year 2004

implies that the magnitude of OTIE in the case of private domestic firms, foreign private firms and public sector firms is 35.2 percent, 29.4 percent and 51.6 percent, respectively. The overall OTIE (of all the 36 firms) is 38.7 percent in the year 2000, which was 28.7 in the year 1990.

Of the 12 private domestic firms only one firm can be seen as optimally efficient (with OTE = 1), whereas OTE is

3 in the case of private foreign firms and 2 in the case of public sector firms. Only one firm in the case of private domestic firms acquired the status of 'globally efficient firm' while 4 firms got the 'locally efficient firm' status in the year 2000. The figure for private foreign firms in the same year is 3 and 4, respectively, whereas it is 2 and 3, respectively for public sector firms. In the case of the

three private domestic firms – Cipla Ltd., Ranbaxy Laboratories Ltd. and Southern Petrochemicals Ind. Corp. Ltd., the PTE score is = 1 and OTE score is < 1. This shows that the OTIE of these firms is not due to managerial inefficiency but to inappropriate scale size. In the case of private foreign firms, this type of inefficiency exists only in case of one firm, i.e. Novartis India Ltd. The same situation is the case among public sector firms, where only in one case is the OTE score less than the PTE score.

Out of the 12 private domestic firms the PTE score in the case of 7 firms is less than the SE score. This means that managerial inefficiency is greater than scale inefficiency. The number of such firms is 8 in the case of private foreign firms and only 3 in the case of public sector firms. This indicates that managerial efficiency in public sector units in the year 2000 has improved and is the best among both private domestic and private foreign firms. Overall, in all three groups the existence of managerial inefficiency is dominant over scale inefficiency.

Table 3 exhibits the overall technical efficiency, pure technical efficiency and scale efficiency of the private domestic firms, private foreign firms (MNC's) and public sector firms of the pharmaceutical industry of India in the year 2004, representing the post-reform period. The visibly clear observation that emerges from the average efficiency scores is that in all the three groups the average OTE, PTE and SE scores have decreased further even compared to the years 2000 and 1990. The highest average overall technical efficiency scores of these firms were in the pre-reform period, i.e. in 1990, followed by the year 2000 while the least are in the year 2004. The average OTE scores of private domestic firms, private foreign firms and public sector firms are 0.575, 0.658 and 0.463, respectively. The PTE scores for these firms are 0.686, 0.742 and 0.740, respectively, whereas the SE scores are 0.849, 0.869 and 0.678, respectively, in the year 2004. The overall OTIE is 43.5 percent, which was 28.7 percent in the year 2000 and 38.7 percent in the year 1990. The average PTIE turned out to be 27.7 percent in the year 2004, 20.3 percent in the year 2000 and 25.6 percent in the year 1990. This implies that pure technical inefficiency decreased after the introduction of reforms, i.e. in 2000, but again increased in the year 2004. The same happened in the case of average scale inefficiency which was 16.3 percent in the year 1990, decreased to 11.1 percent in the year 2000 but again increased to 20.1 percent in the year 2004.

Only one firm of the 12 private domestic firms acquired the status of a 'globally efficient' firm in 2004, whereas there are 4 'locally efficient' firms. In the case of private foreign firms, there were 3 'globally efficient' firms and 4 'locally efficient' firms. The number of 'locally efficient' firms reached 7 the in case of public sector firms and there were 2 'globally efficient' firms. Six public sector firms had a scale efficiency scores < PTE score. This implies that scale inefficiency is dominant in the case of public sector firms in the year 2004 rather than managerial inefficiency. On the other hand, in the case of 6 private foreign firms the PTE score is < SE score, indicating that managerial inefficiency in these firms is greater than the scale inefficiency. In the case of private domestic firms again managerial inefficiency was dominant over scale inefficiency in the year 2004.

Overall, again it can be observed that the OTIE is both due to poor input utilization and failure to operate at optimum scale size. All the 36 firms taken together have a scope of producing 1.79 times as much output from the same level of inputs by improving managerial and scale efficiencies. Individually, the private domestic firms have a scope of increasing output by 1.74 times while employing the same level of inputs in the year 2004. Private foreign firms have a scope of increasing output by 1.52 times and public sector firms can more than double output (i.e. 2.16 times) while utilizing the same level of inputs.

As mentioned earlier, a Mann Whitney test was applied to check whether the difference of efficiency scores among different sets of firms is significant or not. Table IV of the study shows that overall technical efficiency (OTE) is significantly different in the case of private domestic firms and public sector firms, in the case of private foreign firms and public sector firms and all private and public sector firms in the year 1990. However, in the same year, overall technical efficiency was not significantly different in the case of domestic private firms and foreign private firms. As for the pure technical efficiency scores between different groups of firms, in the year 1990 there was no statistically significant difference. Scale efficiency differs significantly between domestic private firms and public sector firms.

Table 4 of the study also shows that overall technical efficiency is significantly different only in the case of private foreign firms and public sector firms and private domestic firms and public sector firms in the year 2000. There was no significant difference between scale efficiency and pure technical efficiency of the firms with

	1990			2000		2004			
	U statistics	p- value	Inference	U statistics	p- value	Inference	U statistics	p- value	Inference
OTE									
Private Domestic Vs Private Foreign	75	0.876	Accept H₀	61.5	0.559	Accept H₀	58	0.449	Accept H ₀
Private Domestic Vs Public Sector	112	0.02	Reject H₀	105	0.059	Accept H ₀	91.5	0.272	Accept H ₀
Private Foreign Vs Public Sector	113	0.017	Reject H₀	108	0.038	Reject H₀	103	0.073	Accept H ₀
All Private Vs Public Sector	225	0.006	Reject H₀	213	0.021	Reject H₀	194.5	0.092	Accept H₀
PTE									
Private Domestic Vs Private Foreign	78	0.733	Accept H₀	76	0.830	Accept H₀	63	0.612	Accept H ₀
Private Domestic Vs Public Sector	101	0.091	Accept H₀	79	0.709	Accept H₀	64	0.654	Accept H ₀
Private Foreign Vs Public Sector	99	0.123	Accept H₀	76	0.841	Accept H₀	69.5	0.899	Accept H ₀
All Private Vs Public Sector	200	0.057	Accept H₀	155	0.723	Accept H₀	133.5	0.732	Accept H₀
SE									
Private Domestic Vs Private Foreign	72	0.986	Accept H ₀	45.5	0.131	Accept H₀	63	6.16	Accept H ₀
Private Domestic Vs Public Sector	107	0.044	Reject H₀	87	0.409	Accept H₀	88.5	0.354	Accept H ₀
Private Foreign Vs Public Sector	104	0.067	Accept H ₀	96	0.176	Accept H₀	93	0.233	Accept H ₀
All Private Vs Public Sector	211	0.025	Reject H₀	183	0.195	Accept H ₀	181.5	0.212	Accept H ₀

Source: Authors' calculations

Table 4: Hypothesis Testing using Mann-Whitney test

different ownership patterns in the year 2000. From table 4 it can further be observed that ownership pattern failed to cause any significant difference in OTE, PTE and SE in the 2004. The 2004 levels of efficiency of private domestic, private foreign and public sector firms were different, but these differences were not found to be statistically significant.

5. Summary and Conclusions

The study tries to evaluate the extent of technical, pure technical and scale efficiencies of the firms categorized on the basis of ownership pattern as private domestic firms, private foreign firms and public sector firms of the Indian pharmaceutical industry. To realize the objectives of the study, a DEA frame work has been applied in which the estimates of technical, pure technical and scale efficiencies for individual firms have been obtained by CCR and BCC models at three points of time i.e. 1990 (indicating the pre-reform period) and 2000 and 2004 (indicating the post-reform period). Three input measures (raw material cost, wages and salaries and fixed assets) and one output measure (net sales) were used. The results indicate that the OTE (in percentage terms) of private domestic firms ranges between 38.3 percent and 100 percent for the year 1990. The magnitude of overall technical inefficiency is 21.4 percent in this case. This suggests that by adopting best practice technology, these firms can reduce their inputs of raw material, wages and salaries and gross fixed assets by at least 21.4 percent and still produce the same level of output. Alternatively these firms have the scope of producing 1.27 times as much as output from the same level of inputs. The magnitude of OTIE of the private foreign firms of the Indian pharmaceutical industry is 21.7 percent for 1990, which is marginally higher than that of private domestic firms.

A comparative analysis for the years 1990 and 2000 shows that average overall technical efficiency scores have decreased in the case of all three groups in the postreform years. The highest decrease in efficiency is in the case of private domestic firms followed by public sector firms and private foreign firms. The results also indicate that managerial efficiency in the public sector units in the year 2000 improved and turned out to be the best among private domestic and private foreign firms. However, in the year 2004, the visibly clear observation from the efficiency scores was that in all three groups of firms the average OTE, PTE and SE scores decreased further compared to 1990 and 2000. The highest average overall technical efficiency scores of these firms were in the year 1990, followed by 2000, while the least were in 2004. Overall, from the whole analysis it can be observed that overall technical inefficiency is both due to poor input utilization (i.e. managerial inefficiency) and the failure to operate at the most productive scale size (i.e. scale inefficiency), although managerial inefficiency dominated all three years among these groups of firms. This means that the firms are more successful in choosing optimal levels of output than adopting best practice technology.

The application of a non-parametric Mann-Whitney Test shows that overall technical efficiency was different in the case of private domestic and public sector firms in the year 1990. The difference was also significant in the case of private foreign and public sector firms, though it was not significant in the case of private domestic and private foreign firms in the pre-reform period. This means that there is a significant role for management and ownership in the overall technical efficiency of these firms. Private sector firms seemed more efficient than public sector firms. This was true in the case of scale efficiency, where again significant differences in scale efficiency emerged between public and private sector firms in 1990. Overall technical efficiency scores were also significantly different in the case of public sector and private sector (both foreign and domestic) firms in the year 2000 (i.e. in the post-reform period). In the subsequent years and in the case of scale efficiency and pure technical efficiency, there were no significant differences for the firms in terms of different ownership patterns.

On the basis of the above findings the study rejects the argument that foreign firms are more efficient than domestic firms and that private firms are more efficient than public sector firms. The significant difference in OTE in the pre-reform year (i.e. 1990) indicates that there might be significant differences in the technology being used by domestic and foreign firms. However, after the reforms (i.e. in the years 2000 and 2004) the nonsignificant difference in OTE in the case of domestic, foreign and public sector firms may imply that there might be speedy technological spillovers among the firms in India. It can therefore be argued that the Indian firms are catching up with foreign firms guite well after the liberalization process. The dominance of

management inefficiency in case of all the three categories of firms indicates that even foreign technology brought by the foreign firms has not induced any competition and the presence of foreign firms has not increased efficiency in domestic firms. This may also be due to poor absorption or diffusion of foreign technology. The efficiency of the foreign firms is on par with the domestic firms, implying that even if foreign firms have brought better technology, domestic business environment and human capital might not be matching factors to generate spillovers. The study suggests that there is ample scope for increasing the efficiency of firms in the Indian pharmaceutical industry by choosing the correct input-output mix and selecting appropriate scale size. The spillover effects can be boosted by creating a better business environment and developing human capital, so that there is no mismatch between domestic human capital and foreign technology. 🖪

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Appendix A: Mann-Whiney U test

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The Mann-Whiney U test is one of the most powerful non-parametric tests for comparing two independent groups of sampled data. Unlike the parametric *t*-test, it makes no assumptions about the distribution of the data. It uses the ranks of the data rather than their raw values to calculate the test statistic. The result of the Mann-Whiney *U* test indicates if there is a significant difference between the median of the two samples. To proceed with the test, the two samples are combined together and ranked from the smallest to the largest value. If the test statistic, which might be the sum of the ranks assigned to one sample, is too small (or too large), then it can be concluded that the values from that population tend to be smaller (or larger) than the other population. It is used for testing the null hypothesis that the two samples have been drawn from the same population. The test hypotheses can be shown as follows:

*H*_o: Population distribution functions of the samples are identical.

 H_1 : The two populations do not have the same means.

The implementation procedure of Mann-Whiney U test can be outlined as follows:

1. Consider two groups with *m* and *n* observations, respectively. All the observations from the two groups are sorted (ascending order) and ranked (the smallest value gets a rank of 1). In the case of tied observation values, the average of the ranks of the underlying observations is assigned to each.

2. Let R_1 be the sum of the ranks of the first group and R_2 be the sum of the ranks of the second group. The test statistic U is the smaller of the two quantities U_1 and U_2 and is calculated as follows:

$$U_1 = mn + \frac{m(m+1)}{2}R_1$$
$$U_2 = mn + \frac{n(n+1)}{2}R_2$$
$$U = \min(U_1, U_2).$$

1. The null hypothesis is rejected at a confidence level of α if the computed value of U is less than or equal to the critical value of U (m, n, α). For smaller sample sizes (m < 20, n < 20), this critical value can be found in tables available in statistical books and for larger sample sizes it can be approximated using

$$U(m,n,\alpha) = \frac{mn}{2} - Z \left[\sqrt{\frac{mn(m+n+1)}{12}} \right]$$

In the above equation, Z is the Z-value of the standard normal distribution at α level.

The Effects of a Shop's Functional Features on Children's Store Preferences

Jelena Filipović, Aleksandar Djordjević*

Abstract:

The aim of this study is to examine how main store dimensions affect children's store preferences in Serbia. Four functional features of these marketplaces were investigated: price of merchandising in the store, the store's arrangement, the sales personnel's attitude towards children and the store's location. Findings suggest that different age cohorts of children react differently to each store's features. With only a few studies available that examine how the functional features of a store can affect children's store preferences in the most developed countries almost nothing is known about this topic in a country in transition such as Serbia. This paper should provide the basis for some future research in this field in the Serbian market and similar markets. Also, the managerial implications for retailers that are interested in the marketing positioning of their stores in the children's market are discussed.

Keywords: Serbian children market, store's features, store's preferences, favourite kids' shops

JEL: M19, M31

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1. Introduction

The rising purchasing power of children throughout the last decades has brought to light yet another important segment of the consumer market. The importance of this market has been recognized both in marketing theory and practice. Research conducted by Sutherland and Thompson in 2001 revealed that children's consumption doubled in the 60s, the 70s and the 80s, while in the 90s it tripled. Some authors estimate that the primary market in the USA accounted for \$9 billion in 1989 and for \$20 billion ten years later (McNeal 1992b, Davidson 1998).

According to McNeal (1992a) the children's market is usually divided into three broad groups: (1) the Primary market (2) the Market of influencers and (3) the Future market. While the above data mostly account for the children's primary market, it should be noted that the market of influencers it is even more significant. Namely, in 1992 this market was estimated at \$132 billion (Power et al. 1991, Step 1993) and at the beginning of the century accounted for \$300 billion (Rosenberg, 2000), affecting family purchases in 62 product categories (McNeal 1992b).

In addition to the indisputable growth in the economic power of children, it is important to understand that their role in consumption has also changed. According to McNeal (1999) and Siegel, Coffey and Livingston (2001), the main shifts in family structure and, therefore, in children's socialization are the following: (1) that families are becoming smaller; (2) the increasing number of single parents; (3) the rise in families' discretionary income; (4) that both parents work long office hours; (5) the greater number of children living in

* Jelena Filipović Faculty of Economics in Belgrade, Serbia e-mail: jfilipovic@ekof.bg.ac.yu

Aleksandar Djordjević

Faculty of Economics in Belgrade, Serbia e-mail: alexandar@ekof.bg.ac.yu

stepfamilies; (6) giving children everything they want in an effort to make up for time not spent with them. Consequently, kids are becoming more independent and proactive in making purchasing decisions for a wide range of products.

As a result, children's responses to different instruments of integrated marketing communications (IMC) have also changed. However, while the marketing and marketing communications literature pays significant attention to the influence of advertising on children's shopping preferences and buying behaviour (McNeal 1999, Acuff and Reiher 1997), research on the effects of other IMC instruments is scarce. Some papers on this matter can be found in well established economies, such as the USA and European Union, yet transitional economies are completely understudied regarding this topic. This research found no previous study concerning this issue in Serbia or any other transitional country. However, we suppose that children in the Serbian market express purchasing behavior in a way similar to their counterparts in developed economies some time ago (when these economies were on a similar level of development regarding stores' formats and stores' atmosphere as Serbia is now).

On the other hand, the importance of store features as an IMC instrument in particular is highly relevant given that early children's consumer socialization starts in retail outlets where they learn their purchasing behaviour in the act of shopping (Moschias and Moore 1979, Ward 1974).

2. Literature Review

Despite relatively high research interest in the children's market, little is known about the factors influencing children's preferences of different stores. Yet we know that these preferences change according to the child's age (McNeal 1992b). For example, younger children (from the age of five through seven) prefer convenience stores and supermarkets for their ease of access and the product range they offer. In contrast, older children (ages 10-12) like the breadth of discount stores (mass merchandisers) and the depth of specialty stores (toy, sporting goods etc.)

In order to explore which store's qualities are crucial for creating a positive image in children's minds a number of authors focused on several important dimensions. Martineau (1958) defined four dimensions: symbols and colour, layout and architecture, advertising and sales personnel. The number of shop features became more numerous over time (Rachman 1975, De Pelsmacker, Geuens, and Bergh 2001) reaching 41 elements (Hansen and Deutscher 1977), including: product selection, sales personnel, location, interpersonal and impersonal communications.

While different authors focused on different store dimensions there were two store dimensions that were consistently found across all studies - affective (atmospheric) features and the functional characteristics of a store. Ghosh (1990) refers to affective features as "the psychological effect or feeling created by a store's design and its physical surroundings." One example of atmospheric dimensions would be the crowding and excitement at a retail store. Up to now there has been very little research on children's perceptions of affective qualities (Williams and Burns 2001). Nevertheless, affective qualities have impacts on consumers' perceptions of the functional attributes of a store (Sirgy and Samli 1985).

Functional aspects were examined much more thoroughly. They can be understood as the operational features of a marketplace, in fact the consumer's perception of the product, pricing and sales people (Weale 1961, Rachman 1975, Darden and Babin 1994). Williams and Burns (2001) argue that the "functional qualities of store image (i.e. merchandise selection, salesperson service, pricing) were strongly influenced by the child's global affective perception of the store's image". However, one very important functional element is usually disregarded, i.e. the location of a marketplace. Nevertheless, some findings show that children tend to like diversity and accessibility, as opposed to homogeneity and privacy (Talen and Coffindaffer 1999). McNeal (1999) identified the following main factors which make some stores preferred by children:

- Acceptable price ranges older children are more sensitive to prices and respond more to sales
- Kid-friendly atmosphere related to affective features of a store
- Kid's products candies, toys, clothes, etc. Newly, some specialty retailers also entered the children market, including specialties as accessories, cosmetics, furniture, home furnishing, as well as catalog and online retailers (Siegel, Coffey and Livingston 2001)
- Eye-level accessible displays they want products within their reach, they like to touch them, smell them and feel them in all possible ways

- Kid-friendly store personnel who will try to help them and not treat them as an unwelcome customer
- Children favor stores favored by their parents and/or friends – children have a very intense urge to fit in their social environment

It should be noted that all previous studies highlighted three factors that determine children's attachment to a given shop: the prices of the goods that shop sells, the shop's arrangement/shop's atmosphere and the attitude of the shop's personnel, which is the reason why we focused on these elements in our own research. Some other factors could be considered relevant but are not consistently present in literature to the same extent as those just mentioned. However, we added also a fourth factor – the ease of access to the store, because we consider it to be a very important determinant of all children's everyday activities and something that cannot be omitted.

A review of the literature however reveals a strong gap in this particular field of study. With just a few studies examining how store functional features can affect children's store preferences in the most developed countries almost nothing is known about it in a country in transition such as Serbia. Therefore, this study aims to explore how the main functional store features affect children's store preferences in Serbia. Moreover, in our study we are particularly interested in finding out whether the influence of the main store features on children's store preferences differs according to the child's age.

3. Research Hypotheses

As explained above, our study focused on children's reactions to different functional features in stores. Among a number of factors examined by other authors, for the purposes of this research we focus on the following:

1) Pricing as a functional feature

By the time children are 8 or 9 years old, they understand the value of money, and they know that products have prices and know to look at price tags (McNeal and McDaniel 1981). A study conducted in 1995 showed that in a given sample almost three-quarters of children demonstrated price-consciousness. The same study revealed two important facts: a) kids care about price and this concern grows with development of their cognitive abilities (as they grow); b) children set upper limits on prices they will pay – mostly for moderately expensive products, such as toys and clothes (McNeal 1999).

In spite of this, children do not usually ask about price when seeking for product information before the purchase (Ward, Wackman, and Wartella 1977). Very few children know the prices for frequently purchased items (Stephens and Moore 1975).

Younger children tend to correlate prices and the physical features of a product. According to Fox and Kehret-Ward (1990), preschoolers usually determine prices based on the size of an item. Ten years old children know that price depends on the amount of production inputs required, while children at the age of 13 perceive price as the function of the quality of the product's inputs and the preferences of potential buyers (Turner and Brandt 1978). Thus, with an assumption that older children are more price sensitive, we hypothesized that:

H1: The importance of price as a criterion for a child's favorite store differs with her/his age

However, because our research concerned Serbia, a country in transition that faced a lack of goods, high inflation rate, high unemployment and low purchasing power throughout the last decade of the 20th century, high price sensitivity among all children market subgroups could be expected. Therefore, we assume that in general price has a high importance as a criterion for determining the favorite stores of children in Serbia, which is certainly greater than in other developed countries.

2) Arrangement as a functional feature

There are several aspects of a store that must be taken into consideration: merchandise selection, the color that prevails in its decoration, accessibility of shelves and general atmosphere. Williams and Burns (2001) argue that "the most important functional quality that influenced a child's loyalty for the discount store was the merchandise selection."

Another study (Clark 1997) points to the significance of colors. It states that children's favourite colours are purple, red, yellow, blue and green, whereas they dislike light, dark, smudgy or sophisticated colors. The same study advised against breaking standard flavor codes such as pink or red for strawberries, brown for chocolate, etc. Children feel comfortable in places associated with activity and social interaction (Talen and Coffindaffer 1999, Klepacki 1998) and retailers should provide them with those kinds of areas. Younger children like brightly coloured carpeting, low and rotating shelves, extra wide aisles, colourful displays, flexible fixtures and miniature shopping carts (Barr 1998, Sternman 1998).

Retailers have learned recently that shopping for kids is an environmental experience and thus the retail environment must meet this need. For example, the American retailer *Limited Too*, targeting primarily tween girls, offers girls in their stores sample nail polish and make-up, allows them to try on clothes, to try out furniture for their rooms, to look through popular magazines and finally, gives them candy (Siegel, Coffey and Livingston 2001). On the other hand, toy stores targeting preschoolers usually offer a different kind of ambience – for example, *Turbo Limach*, a regional toy retailer, provides children with the opportunity to create their own teddy bear, which employs a different store arrangement than the one previously mentioned (*Limited Too*).

Since this study has not found any previous research that addressed whether children of different ages react differently to the same store's arrangement, we based our second hypothesis on market observations:

H2: The significance of the store arrangement as a criterion for the child's favorite store differs according to the child's age

3) Sales personnel as a functional feature

A child's most distinct needs are to be loved and accepted by its peers and parents (Acuff and Reiher 1997). Therefore, they like spaces which are friendly, where they feel safe and protected. Despite the fact that some findings show that salespeople have almost no effect on children's store loyalty (Williams and Burns 2001) the significance of shop personnel should not be neglected.

Children prefer salespeople who are kid-focused, enthusiastic and who treat them with respect (Barr 1998). Hence, we hypothesized that the kindness of salespeople is important equally for both younger and older children.

H3: Salespeople's attitude towards children is important for children of all ages, in order to perceive a given store as their favourite.

"A store that greets children, provides gifts for children (cookies, balloons, e.g.) and has shopping facilitators for children (scaled-down shopping carts, eyelevel displays, e.g.) will attract children and make a good impression on them – an impression, incidentally, that may last a lifetime." (McNeal 1992b).

4) Ease of access as a functional feature

Surprisingly, there have been almost no studies that address this aspect of a store, with regard to children's preferences in that marketplace. It could be concluded naturally that this is the crucial factor which determines whether a given shop is preferred more by children. However, McNeal (1992b) argues that due to the fact that children are limited by transportation and their parents' permission to visit stores they may spend money in stores that are convenient for them (on their way from home to school) even though the stores rate low on their preference scale. We hypothesized the following:

H4: The importance of accessibility as a criterion for a child's favorite store differs according to the child's age

4. Research Design

Studies conducted in this field can be grouped into two categories according to the methodology they have applied: i) those using experimental research and ii) those based on a survey of consumer attitudes. The second methodology is more common and our survey belongs to this category. In line with the fact that all previous studies conducted in this field (and with this type of respondents) have used the survey approach and that surveys are the most efficient method for broad samples, we opted for this method.

Our survey was organized as a self-administered survey with convenience sampling. The sample population consisted of children 7-8 and 12-13 years old who attended six schools in five cities (with two schools in the capital city) all over the territory of Serbia. These age cohorts were chosen based on psychological findings related to child development. It must be stated herein that the segmentation of children based on their age vastly differed from author to author. There is no universally accepted framework that reflects child development stages regarding the choice of stores. In marketing surveys concerning the children's market the most-commonly used is Piaget's theory, which proposes 4 main stages of cognitive development: birth to age 2, 2-7, 7-11 and 11 through adulthood (Roedder-John 1999). However, it is very difficult to find consistent opinion on the matter of drawing sub-segments within these quite

broad segments. For example, Siegel, Coffey and Livingston (2001) consider children 8-12 years old a specific consumer group, Lindstrom and Seybold (2003) deem that children aged 8-14 have similar consumption patterns, while McNeal (1992a, 1999) does not distinguish between children's age groups at all. However, many authors (McNeal 1999, Maricic 2009, Roedder-John 1999) suggest that children from the age of 7 are sufficiently developed and can make independent decisions, selfevaluate and articulate perceptions

City	Age	Boys	Girls	Total
	7	23	21	44
Polarado	8	40	22	62
Deigrade	12	25	31	56
	13	24	27	51
		112	101	213
	7	12	10	22
Valiavo	8	9	8	17
valjevo	12	9	11	20
	13	8	7	15
		38	36	74
	7	10	11	21
Nie	8	10	12	22
INIS	12	9	17	26
	13	10	12	22
		39	52	91
	7	7	15	22
Novi Sad	8	6	14	20
NUVI Sau	12	6	11	17
	13	14	14	28
		33	54	87
	7	10	9	19
Sabar	8	11	12	23
Jubac	12	8	9	17
	13	10	11	21
		39	41	80
Total		261	284	545

Table 1: Survey plan

For the survey we developed two types of questionnaires – one for the age group 7-8 and the other for children between 12-13 years old. The questionnaire for the younger group was in color, containing drawings and pictures, while for the older group it was black and white and included less graphic objects. The total list of respondents broken down by city, age and gender is

provided in Table no. 1. As can be seen in the previous table (no. 4.1.), the number of male and number of female respondents is almost equal (48% and 52%, respectively). There were 500 usable questionnaires, while 9% had to be discarded. Even though the questionnaires were self-administered, the authors were present for assistance. All children were asked to complete a questionnaire during a class.

5. Findings and Discussion

In order to test our hypotheses we transformed the questions into four variables. Since all the results are represented as proportions, we performed a chi-square test of independence. The aim of this test is to examine whether two variables are independent or not. The chi-square test is commonly used to compare observed data with data we would expect to obtain according to a specific hypothesis. This statistic always tests a null hypothesis which states that there is no significant difference between the expected and observed result. Given that the collected data was ordinal in format, a goodness-of-fit test could not have been performed. The significance level in all four cases was set up at $p \le 0.05$.

It should be noted that in the second column of table 2, the possible answers to all questions in the questionnaire were "yes" or "no". Each respondent had to choose a maximum of three out of six store features that make that store her/his favorite. As can be observed in the following table, the number of degrees of freedom is one in all cases. The standard level of chi-square statistics, at the significance level of $p \le 0.05$ and df=1 is 3.841.

First, it has been proved in previous studies (listed in the second part of this paper), that children's sensitiveness to prices differs by their age. This statement was proven for Serbia as well (p=0.000). Actually, the value of the chi-square test is 14.671, which is more than 3.841, so we cannot accept research hypothesis H1. It has already been stated that children in Serbia experienced a severe lack of pocket-money and goods during the 90s; therefore, it is not surprising that 34% of children between the ages of 7 and 8 prefer stores that sell cheap products. However, it is surprising that only 19% of children in the older cohort share the same point of view. This could be explained by the fact that 12 and 13-yearolds care more about peers' opinions (Siegel, Coffey, and Livingston 2001) and consequently, favor stores that most of their friends prefer, not taking into account the prices of the merchandise.

Examined store's		Child	's age		Pearson		
feature		7-8	12-13	Total	Chi-Square Value	p-value	
Chaon nuisea	yes	83	49	132			
Cheap prices	no	159	207	366	14,671	0,000	
Total		242	256	498			
Arrangement	yes	84	104	188		0,196	
Arrangement	no	157	152	309	1,757		
Total		241	256	497			
Kind	yes	122	86	208			
sales personnel	no	122	170	292	13,841	0,000	
Total		244	256	500			
Vicinity of store to child's	yes	131	55	186			
or home	no	113	201	314	55,460	0,000	
Total		244	256	500			

Table 2: Results of chi-square test

In contrast to our expectations, there is no statistically significant difference in store decoration appreciation between the two groups of children (p=0.196, chi-square=1.757<3.841). Namely, 40.6% of the older group and 34.8% of the younger group evaluates a shop by this feature. This finding can be very beneficial for managers in creating a distinct advantage for their business in the children's market in Serbia. It should be noted that the results show that younger children have equal concerns about prices and the store's arrangement, whereas older children care more about the shop's decoration than the prices of its merchandise.

At this point, in order to have a better understanding of the chi-square value in the table (13.841), it would be useful to remind that H3 stated that the kindness of salespeople is equally important for both younger and older children. With regard to the fact that there is no evidence that there is a relation between children's age and their store's preferences based on sales personnel attitude, we can conclude that all children equally care how they are treated by marketplace staff.

The final hypothesis was used to examine the importance of the store's location as a functional feature. It is clear from table 2 that the significance of this shop's aspect varies with the child's age (p=0.000, chi-square=55.460>3.841). More than half (53.7%) of children aged 7-8 stated that their favorite marketplace is near their school or home. This finding is in accordance with McNeal's study (1992b), which discovered that young children prefer convenience stores. Most probably they are not allowed by their parents to go to distant parts of town, so they have to shop in their neighborhoods. In

contrast, 21.5% (which is less than half of the number of younger respondents that chose this answer for the same question) of older kids stressed this feature as important for their favorite store.

6. Conclusions, Limitations and Further Research Directions

To sum up, there are several conclusions that could be drawn from this research: a) younger cohorts (7-8 years old) are very concerned with prices, while older cohorts primarily care about the image of the store and how it reflects on their personal image; b) all children equally care about the shop's arrangement and therefore this is one of the most prominent aspects that could be changed in order to help sales; c) not surprisingly, for children it is very important how they are treated by marketplace staff; this is a crucial store feature to have loyal young customers; d) one of the least investigated among store aspects – vicinity to children's homes or schools, was proven to be very important for younger children, while far less so for older ones.

Several limitations to this study can be listed here. One of the most common is that the sample used in this survey was a convenience sample. As such, the representativeness of the sample cannot be determined. Secondly, all collected data was given as proportions, so the only suitable statistic was the chi-square test, which provides us with fewer results and is less accurate than other statistics. The answers format can be justified by the inability of children to evaluate the degree of their emotions on appropriate scales. Furthermore, the survey was conducted only in cities, and consequently we cannot draw conclusions about the attitudes of rural children towards store features. We can also only assume that there would be statistically significant differences with regard to favorite stores according to the children's towns of residence, because some sales places (e.g. shopping malls) are not equally present in Serbian territory, but our research cannot examine this fact due to low numbers. Finally, this is the first study in this field in Serbia, so it was not possible to examine the shift in children's preferences over time. Moreover, there is a lack of studies regarding this topic in other transitional countries, so such a comparison was not possible.

Future research directions should include extending this research to investigating and understanding child preferences regarding shops' features in other countries – above all, in other Eastern European countries in transition. In addition, research could be extended to understanding other important aspects of children's favorite marketplaces in addition to the aspects addressed in this study. A detailed and thorough survey should also examine children's preferences with regard to the type of store (supermarkets, toy stores, book stores, etc.).

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