Chapter 5

Micro Study: Philippines Does Trade Protection Improve Firm Productivity? Evidence from Philippine Micro Data

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CHAPTER 5

Micro Study: Philippines
Does Trade Protection Improve Firm Productivity? Evidence from Philippine Micro Data

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This paper examines the impact of trade policy changes on firm productivity in the Philippines, characterized by an incomplete liberalization process and reversal of policy in midstream. Though the Philippines implemented substantial trade reforms from the 1980s up to the mid-1990s, it adopted a selective protection policy in the early 2000s. The regression results show that among firms in the purely importable sector, trade protection is negatively associated with firm productivity. For firms in the mixed sector, a negative relationship is also present, but is not statistically significant. Among firms in the purely exportable sector, the evidence is weak due to the strong bias of the system of protection against exportable. Coinciding with policy reversal, the aggregate productivity of the purely importable and mixed sectors both declined from 1996 to 2006. In contrast, the productivity of the purely exportable and non-traded sectors increased during the same period. This paper shows that the selective protection policy not only reversed the productivity gains from the previous liberalization, but undermined the output restructuring from less productive to more productive firms that was already underway as the protection of selected sectors allowed inefficient firms to survive.

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1. Introduction

The old theory of international trade tells us that welfare gains from trade arise from specialization based on comparative advantage. In the new trade theory, gains result from economies of scale and product varieties that are available to consumers. Empirical evidence shows that an additional source of gains arises from improved productivity. In these studies, the assumption of firm heterogeneity within an industry has been adopted in contrast to traditional models that rely on the representative firm assumption. In the presence of 'within-industry' firm heterogeneity, trade liberalization may lead to improved productivity through the exit of inefficient firms and the reshuffling of resources and outputs from less to more efficient firms. Melitz (2002) points out that trade opening may induce a market share reallocation towards more efficient firms and generate an aggregate productivity gain, without any change at the firm level. Although increases in the exposure to trade always generate more import competition, exit is always driven not by competition from imports but by the entry of firms motivated by the higher relative profits accruing to exporters. Melitz further notes that since entry into new export markets is costly, then exposure to trade affects firms with different productivity levels in several ways. The new export markets offer increased profit opportunities exclusively to the more productive firms who can pay the export market entry costs. Therefore, it is the pull of the export markets rather than the push of import competition that forces the least productive firms to exit.

Studies indicating that productivity improves following liberalization include Pavcnik (2000) for Chile, Fernandes (2003) for Columbia, Topalova (2003) and Chand and Sen (2000) for India, Amiti and Konings (2004) and Muendler (2002) for Indonesia along with Schor (2003) for Brazil and Ozler and Yilmaz (2001) for Turkey. In India, Krishna and Mitra (1998) also found evidence of a significant favorable effect of reforms on industrial productivity. In another study using effective protection rates (EPRs) and import coverage ratios as trade liberalization variables, Goldar and Kumari (2003) found the coefficient on EPR to be consistently negative and statistically significant. However, the coefficient on the nontariff variable was found to be positive (contrary to an expected relationship) but insignificant. In Korea, Kim (2000) employed

legal tariff rates, quota ratio, and nominal protection rates as trade liberalization variables. He found that trade liberalization had a positive impact on productivity performance, although the productivity increase was not significant because the extent of trade liberalization was not substantial enough. Earlier works by Haddad (1993), Harrison (1994), and Tybout and Westbrook (1995) for the Ivory Coast and Mexico also showed a positive link between liberalization and productivity growth.

There are however, studies that showed the opposite. For instance, Bernard and Jones (1996) found weak support for productivity improvements after trade liberalization. The theoretical literature on trade and productivity provides conflicting predictions on the impact of trade liberalization on productivity. On the one hand, trade liberalization can lead to productivity gains through increased competition, the exit of inefficient firms and reallocation of market shares in favor of more efficient firms, increasing scale efficiency, or through learning by exporting effects. On the other hand, as Rodrik (1988, 1992) argued, there are no reasons to believe that protection discourages productivity improvement. In fact it is import liberalization that retards productivity growth by shrinking domestic sales and reducing incentives to invest in technological efforts. Thus whether liberalization really improves efficiency in less developed countries is ambiguous and has remained an empirical question.

As with many developing countries and transition economies, the Philippines opened up its domestic economy to international trade starting in the 1980s. The government implemented several trade liberalization programs during the 1990s. The unilateral reforms in the 1980s were initiated through a World Bank structural adjustment loan, while those in the 1990s were carried out in line with the country's commitments under the General Agreement on Tariffs and Trade-World Trade Organization (GATT-WTO), and the Association of South East Asian Nations Free Trade Area Common Effective Preferential Tariff Scheme (AFTA-CEPT).

After more than two decades of trade liberalization in the country, there is still very little firm-level empirical research on the impact of trade reforms on productivity. One major reason for the paucity of micro-level trade and productivity studies in the country is the absence of firm-level panel data. Most of the studies carried out in the past were largely based on macro-level analysis and ex-ante assessment using economy-wide CGE models.

This paper will focus on the assessment of the impact of trade policy changes on firm productivity in the Philippine manufacturing industry using micro level data. The Philippines presents an interesting case due to its adoption of selective protection amidst an incomplete trade liberalization process. Though substantial reforms were carried out from the late 1980s to the mid-1990s, it reversed its trade policy in the early 2000s. A firm-level panel dataset covering the manufacturing industry was created based on the survey and census data of the National Statistics Office for the period 1996 to 2006 (with missing years for 1999, 2001, and 2004). The paper is divided into 6 sections. After the introduction, section 2 discusses the various episodes of trade policy reforms and analysis of the performance and structure of the manufacturing industry. Section 3 provides a brief review of the trade and productivity studies in the Philippines. Section 4 presents the methodology and description of the data used in the paper. Section 5 analyzes the results, and section 6 summarizes the findings and policy implications of the paper.

2. Trade Policy Reforms in the Philippines

2.1. Trade Policy Reforms: 1980s-2000s

Since the early 1980s, the Philippines have liberalized its trade policy by reducing tariff rates and removing import quantitative restrictions (see Table 1). The first tariff reform program (TRP 1) initiated in 1981, substantially reduced the average nominal tariff and the high rate of effective protection that characterized the Philippine industrial structure. TRP I also reduced the number of regulated products with the removal of import restrictions on 1,332 lines between 1986 and 1989.

Table 1. Major Trade Policy Reforms in the Philippines (1980s-early 2000s)

Year	Trade Reform	Description
1980	**Tariff Reform Program I** EO 609 and EO 632-A (January 1981)	TRP 1 reduced the level and dispersion of tariff rates from a range of 0 to 100 percent in 1980 to a range of 10 percent to 50 percent and removed quantitative restrictions beginning in 1981 and ending in 1985
1990	EO 413 (July 1990)	EO 413 aimed to simplify the tariff structure by reducing the number of rates to 4, ranging from 3 percent to 30 percent over a period of one year, but was not implemented.
1991	**Tariff Reform Program II** EO 470 (July 1991)	TRP II reduced the tariff range to within a three percent to 30 percent tariff range by 1995
1992	EO 8	EO 8 translated to tariffs, the quantitative restrictions for 153 agricultural products and tariff realignment for 48 commodities
1995	**Tariff Reform Program III** EO 264 (August 1995)	EO 264 further reduced the tariff range to three percent and ten percent levels, reduced the ceiling rate on manufacture goods to 30 percent while the floor remained at 3 percent, and created a four-tier tariff schedule: 3 percent for raw materials, 10 percent for locally available raw materials and capital equipment, 20 percent for intermediate goods, and 30 percent for finished goods
	EO 288 (December 1995)	EO 288 modified the nomenclature and import duties on non-sensitive agricultural products
1996	EO 313 (March 1996)	EO 313 modified the nomenclature and increased the tariff rates on sensitive agricultural products
	RA 8178	RA 8178 lifted the quantitative restrictions on 3 products and defined minimum access volume for these products
1998	EO 465 (January 1998)	EO 465 corrected remaining distortions in the tariff structure and smoothened the schedule of tariff reduction in 23 industries identified as export winners
	EO 486 (June 1998)	EO 486 modified the rates on items not covered by EO 465
1999	EO 63 (January 1999)	EO 63 adjusted the tariff rates on 6 industries Freezing of tariff rates at 2000 level until 2001
2001	EO 334 (January 2001)	EO 334 adjusted the tariff structure towards a uniform tariff rate of 5 percent by the year 2004
	EO 11 (April 2001)	EO 11 corrected the EO 334 tariff rates imposed on certain products
	EO 84 (March 2002)	EO 84 extended existing tariff rates from January 2002 to 2004 on various agricultural products
	EO 91 (April 2002)	EO 91 modified the tariff rates on imported raw materials, intermediate inputs, and machinery and parts
2003	EO 164 (January 2003)	EO 164 maintained the 2002 tariff rates for 2003 covering a substantial number of products
	EO 241 (October 2003)	EO 241 and EO 264 adjusted tariff rates on finished products and raw materials and intermediate goods, respectively.
	EO 264 (December 203)	

Source: Aldaba (2005).

The second phase of the tariff reform program (TRP II) was launched in 1991. TRP II introduced a new tariff code that further narrowed down the tariff range with the majority of tariff lines falling within the 3 to 30 % tariff range. It also allowed the tariffication of quantitative restrictions for 153 agricultural products and tariff realignment for 48 commodities. With the country's ratification of the World Trade Organization (WTO) in 1994, the government committed to remove import restrictions on sensitive agricultural products except rice, and replace these with high tariffs.

The government initiated another round of tariff reforms (TRP III) in 1995 as a first major step in its plan to adopt a uniform 5 % tariff by 2005. This further narrowed down the tariff range for industrial products to within 3 and 10 % range and reduced the ceiling rate on manufactured goods to 30 % while the floor remained at 3 %. It also created a four-tier tariff structure: 3 % for raw materials and capital equipment which were not locally available, 10 % for raw materials and capital equipment which were locally available, 20 % for intermediate goods, and 30 % for finished goods.

In 1996, Republic Act 8178 legislated the tariffication of quantitative restrictions imposed on agricultural products and the creation of tariff quotas. Tariff quotas imposed a relatively lower duty up to a minimum access level (or in-quota rate) and a higher duty beyond this minimum level (or out-quota rate). This brought down the percentage of regulated items from about 4 % in 1995 to 3 % of the total number of product lines in 1996. By 1997, most quantitative restrictions were lifted, with the important exception of rice.

Executive Order 465 was legislated in January 1998 to further refine the tariff structure and gradually implement the tariff reduction on 23 industries identified as export winners. EO 486, a comprehensive tariff reform package, was signed to modify the rates on product lines not covered by EO 465. However, after 6 months, Executive Order 63 was issued to increase the tariff rates on textiles, garments, petrochemicals, pulp and paper, and pocket lighters. It also froze tariff rates at their 2000 levels. In January 2001, EO 334, which was to constitute TRP IV, was passed to adjust the tariff structure towards a uniform tariff rate of 5 % by the year 2004, except for a few sensitive agricultural and manufactured items. This was never implemented, as a series of executive orders were passed to either postpone or increase tariff rates on selected products. In 2003, a comprehensive tariff review was carried out which culminated in

the legislation of Executive Orders 241 and 264. These twin Executive Orders modified the whole tariff structure such that the tariff rates on goods that are not locally produced goods were made as low as possible while the tariff rates on locally produced goods were adjusted upward.

2.2. Structure of Protection: 1998-2004

As discussed in the preceding section, significant progress was made to reduce tariffs and remove import restrictions from the 1980s up to the mid-1990s. It is evident from Table 2 that the overall level of tariff rates is already low. The average tariff rate for all industries is 6.82 % as of 2004. Agriculture has the highest average tariff rate of 11.3 %. Unlike the rest of the sectors where ad valorem tariffs are applied, tariff quotas are used in agriculture. The average for manufacturing is almost the same as the average for all sectors at 6.8 %. Fishing and forestry has an average rate of 6 % while mining and quarrying is the lowest at 2.5 %.

Table 2. Average Tariff Rates: 1998-2004

	1998	1999	2000	2001	2002	2003	2004
All Industries	11.32	10.25	8.47	8.28	6.45	6.6	6.82
Coefficient of variation	0.96	0.91	0.99	1.04	1.17	1.06	1.07
% of tariff peaks	2.24	2.24	2.48	2.5	2.69	2.53	2.71
No. of tariff lines	7,366						7,382
Agriculture	15.9	13.2	11.5	12.3	10.4	10.4	11.3
Coefficient of variation	1.07	1.14	1.3	1.23	1.31	1.22	1.17
Fishing & forestry	9.4	8.9	6.7	6.7	5.8	5.7	6
Coefficient of variation	0.63	0.7	0.66	0.62	0.45	0.48	0.57
Mining & quarrying	3.3	3.3	3.1	3.2	2.8	2.7	2.5
Coefficient of variation	0.42	0.41	0.24	0.23	0.38	0.4	0.48
Manufacturing	11.38	10.35	8.5	8.28	6.39	6.57	6.76
Coefficient of variation	0.93	0.88	0.95	1	1.13	1.03	1.03

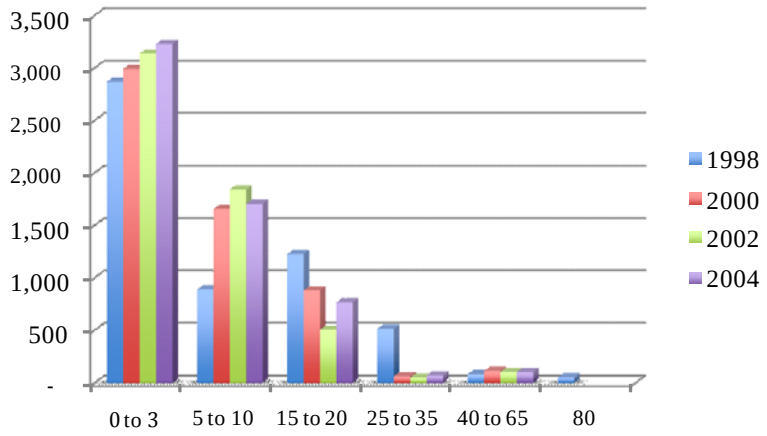
Table 3 shows the declining weighted average tariff rates by more detailed industry sectors from 1988 to 2004. High tariffs on tobacco and garments were substantially reduced from the highest level of 50% in 1988 to 10 and 15% respectively, in 2004. Other highly protected manufacturing sectors such as leather products, textiles and furniture, also experienced the same. In terms of frequency distribution, Figure 1 shows

that in 2004, more than 50% of the total numbers of tariff lines were already clustered in the 0 to 3% tariff range while 29% were in the 5 to 10% range. 13% were in the 15 to 20% tariff range, 1% in the 25 to 35% tariff range, and 2% in the 40 to 65% tariff range. Between 2002 and 2004, the number of lines in the 15 to 20% tariff range fell but those in the 25 to 35% range increased.

Table 3. Weighted Average Tariff Rates

PSIC	Description	1988	1994	1998	2002	2004
01	Growing of Crops	42	38	28	20	21
02	Farming of Animals	25	21	25	20	19
03	Agricultural and Animal Husbandry	30	19	3	3	2
05	Forestry, Logging and Related Activities	21	16	3	3	3
06	Fishing, Aquaculture and Service	35	29	12	7	7
10	Metallic Ore Mining	26	6	3	3	3
11	Non-Metallic Mining and Quarrying	16	11	4	3	3
15	Food Products & Beverages	36	32	29	21	21
16	Tobacco Products	50	50	20	7	10
17	Textile	41	33	16	9	11
18	Wearing Apparel	50	50	25	15	15
19	Leather, Luggage, Handbags and Footwear	46	44	19	8	11
20	Wood, Wood Products & Cork	36	27	15	7	8
21	Paper and Paper Products	33	23	13	6	5
22	Publishing, Printing and Reproduction of Recorded Media	23	18	17	7	6
23	Coke, Refined Petroleum & other Fuel	16	11	4	3	3
24	Chemicals and Chemical Products	27	19	8	4	5
25	Rubber and Plastic Products	37	29	14	8	9
26	Other Non-Metallic Mineral products	37	23	12	5	7
27	Basic Metals	20	16	8	4	4
28	Fabricated Metal Products, Except Machinery and Equipment	31	26	13	7	7
29	Machinery and Equipment, n.e.c.	23	13	5	2	2
31	Electrical Machinery and Apparatus, n.e.c.	31	19	8	4	4
33	Medical, Precision and Optical Instruments, Watches and Clocks	23	18	6	3	3
34	Motor Vehicles, Trailers and Semi-Trailers	34	25	17	12	12
36	Furniture	47	33	21	12	13
37	Manufacturing , n.e.c.	37	26	11	5	6

Figure 1. Frequency Distribution of Tariff Rates



Note, however, that a lower level of tariff rates does not always imply that the tariff schedule is less distorting. The economic and trade distortions associated with the tariff structure depend not only on the size of tariffs but also on the dispersion of these tariffs across all products. In general, the more dispersion in a country's tariff schedule, the greater the distortions caused by tariffs on production and consumption patterns. Common measures of dispersion used are percentage of tariff peaks and coefficient of variation. Tariff peaks are represented by the proportion of products with tariffs exceeding three times the mean tariff, while the coefficient of variation is the ratio of the standard deviation to the mean.

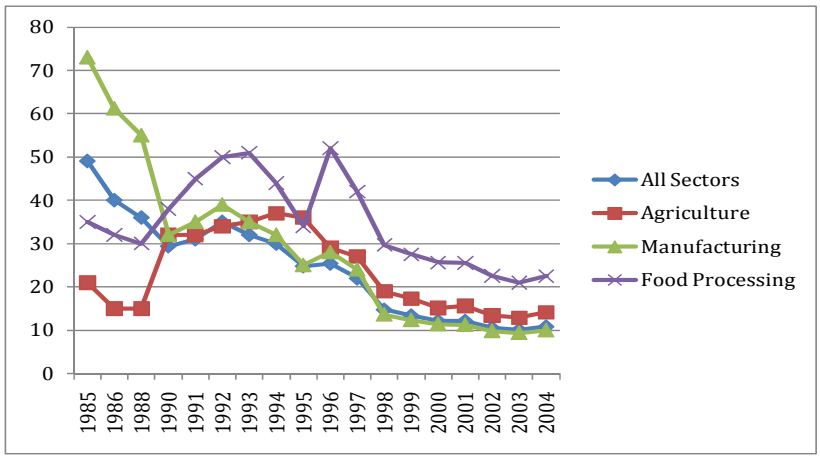
As Table 2 shows, while the average tariff rate for all industries dropped from 11.32 % in 1998 to 6.82 % in 2004, tariff dispersion widened as the coefficient of variation went up from 0.96 to 1.07. The ad valorem tariffs for mining and quarrying as well as those for fishing and forestry show the most uniformity, while those for agriculture and manufacturing exhibit the widest dispersion. Growing of crops (21%) and farming of animals (19%) along with food manufacturing (21%) have the highest average tariffs (see Table 3). The first 2 sectors are inputs to food manufacturing. Meanwhile, electrical and non-electrical machinery have the lowest average tariff rates ranging from 2 to 4%.

Table 2 also indicates an increase in the percentage of tariff peaks (tariffs that are greater than three times the mean tariff) from 2.24 in 1998 to 2.71 in 2004. The sectors with tariff peaks consisted mostly of agricultural products with in- and out- quota rates.

The sectors with tariff peaks consisted of sugarcane, sugar milling and refining, palay, corn, rice and corn milling, vegetables such as onions, garlic, and cabbage, roots and tubers, hog, cattle and other livestock, chicken, other poultry and poultry products, slaughtering and meat packing, coffee roasting and processing, meat and meat processing, canning and preserving fruits and vegetables, manufacture of starch and starch products, manufacture of bakery products excluding noodles, manufacture of animal feeds, miscellaneous food products, manufacture of drugs and medicines, manufacture of chemical products, and manufacture and assembly of motor vehicles.

Compared to tariff rates, effective protection rates (EPRs)[2] provide a more meaningful indicator of the impact of the system of protection. EPRs measure the net protection received by domestic producers from the protection of their outputs and the penalty from the protection of their inputs. Figure 2 shows that average effective protection rates for all sectors declined from 49% in 1985 to 36% in 1988. In 1995, this further dropped to around 25% and to 15% in 1998 and to 10.9% in 2004.

Figure 2. Effective Protection Rates (1985-2004)



Note that while the average effective protection rates for all sectors declined, substantial differences in average protection across sectors still prevail. With the tarification of quantitative restrictions in agricultural products in 1996, a shift in relative protection occurred which resulted in higher protection for the agriculture sector relative

[2] EPRs are rates of protection of value added, are more meaningful than actual tariff rates and implicit tariff rates (representing excess of domestic price of a product over its international price) since it is value added rather than the value of the product that is contributed by the domestic activity being protected.

to the manufacturing industry. Though the two sectors had almost the same EPR in 1993, in succeeding years, the agriculture sector received much higher protection than the manufacturing sector. In 1995, agriculture had an EPR of 36 % while manufacturing had 25 %. This gap was narrowed in 1997 as agriculture EPR dropped to 27 % while manufacturing EPR was 24 %. Within manufacturing, wide disparities in effective protection have also been present. Food processing has remained the most highly protected sub-sector over the last twenty years.

Table 4 presents the average EPR for the years 1998 to 2004. Though the average EPR for all industries is already relatively low, protection continues to be uneven as indicated by the high levels of coefficients of variation, particularly in manufacturing. After falling from 3.68 in 2000 to 2.54 in 2001, it increased to 2.64 in 2004. Among the major economic sectors, agriculture continued to enjoy the highest level of protection from 1998 to 2004. Protection of importable also remained relatively higher than exportable. Manufacturing exportable continued to register negative EPRs indicating that they were penalized by the system of protection.

Table 4. Average Effective Protection Rate

	1998	1999	2000	2001	2002	2003	2004
All Sectors	**14.75**	**13.41**	**12.13**	**12.18**	**10.55**	**10.11**	**10.88**
Importable	25.64	23.45	21.21	21.11	18.82	18.05	19.09
Exportable	3.45	2.99	2.72	2.92	1.98	1.88	2.36
CV	2.82	2.91	3.21	2.19	2.13	2.23	2.27
Agriculture, Fishing, & Forestry	**18.98**	**17.29**	**15.12**	**15.63**	**13.38**	**12.86**	**14.15**
Importable	22.67	20.35	19.01	19.48	17.97	17.26	18.09
Exportable	15.36	14.29	11.31	11.85	8.89	8.55	10.3
CV	0.75	0.71	0.77	0.83	0.88	0.82	0.77
Mining	**2.52**	**2.6**	**2.65**	**2.67**	**2.41**	**2.36**	**2.28**
Importable	3.86	3.8	3.44	3.33	2.77	2.71	2.57
Exportable	2.01	2.15	2.35	2.42	2.28	2.23	2.17
CV	0.79	0.76	0.68	0.66	0.68	0.69	0.69
Manufacturing	**13.61**	**12.34**	**11.37**	**11.23**	**9.79**	**9.36**	**9.96**
Importable	27.3	25.1	22.48	22.17	19.53	18.72	19.87
Exportable	-1.57	-1.81	-0.96	-0.89	-1.02	-1.02	-1.04
CV	3.27	3.4	3.68	2.54	2.45	2.58	2.64

Note: CV or coefficient of variation is the ratio of the standard deviation to the mean.
Source: Manasan, R. & V.Pineda (1999), Aldaba (2005).

Table 5 presents weighted average effective protection rates (EPRs) by more detailed industry sectors. In 2004, the calculated EPRs ranged from negative rates to 35%. Export-oriented sectors such as machinery and equipment (-0.08%), and basic metals (-2%) were penalized by the system of protection as indicated by their negative EPRs (which may be due to tariffs on their inputs being higher than tariffs on the final outputs). The other penalized sectors included wearing apparel; leather; electrical machinery & apparatus, nec; medical precision and optical instruments; and other manufacturing sectors.

Table 5. Average Effective Protection Rates

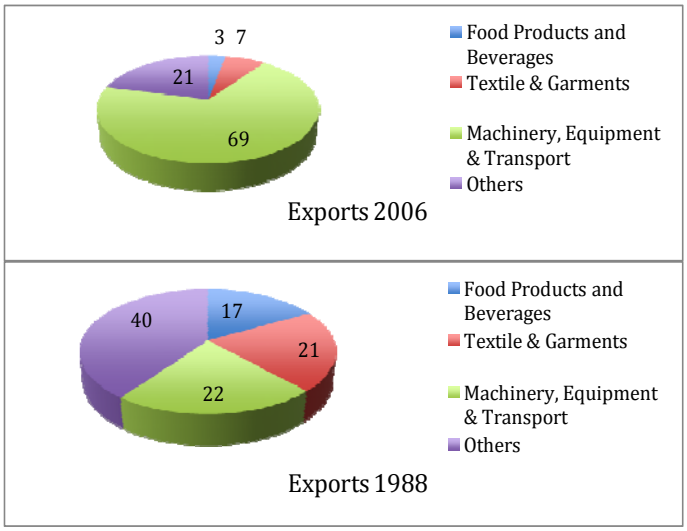
PSIC	Description	1988	1994	1996	1998	2002	2004
01	Growing of Crops	9.58	23.28	26.5	17.82	11.34	12.67
02	Farming of Animals	16.55	12.27	12.63	40.38	35.67	35.11
05	Forestry, Logging and Related Activities	-20.23	11.52	10.89	3.15	2.91	2.65
06	Fishing, Aquaculture and Service Activities Incidental to Fishing	5.24	19.3	4.66	11.11	5.99	6.66
10	Metallic Ore Mining	0.16	-2.19	-1.25	2.16	2.44	2.33
11	Non-Metallic Mining and Quarrying	17.2	14.02	6.16	3.3	2.37	2.19
15	Manufacture of Food Products and Beverages	27.9	37.25	42.37	29.7	22.54	22.49
16	Manufacture of Tobacco Products	61.12	52.68	31	20.02	6.57	11.21
17	Manufacture of Textile	44.24	18.72	11.8	12.07	6.67	7.7
18	Manufacture of Wearing Apparel	0	24.17	14.41	-3.84	-1.8	-2.44
19	Tanning and Dressing of Leather; Manufacture of Luggage, Handbags and Footwear	0.77	22.09	13.19	-0.72	-0.85	-0.47
20	Manufacture of Wood, Wood Products and Cork, Except Furniture; Manufacture of	26.94	17.9	20.02	2.96	0.68	0.91
21	Manufacture of Paper and Paper Products	177.5	24.06	19.63	6.89	2.6	2.57
22	Publishing, Printing and Reproduction of Recorded Media	436.8	19.92	18.52	6.79	2.65	1.71
23	Manufacture of Coke, Refined Petroleum and other Fuel Products	40.4	15.33	4.54	2.04	1.84	1.83
24	Manufacture of Chemicals and Chemical Products	226.58	14.64	9.45	5	2.88	3.45
25	Manufacture of Rubber and Plastic Products	40.08	25.79	19.8	2.87	0.77	0.88
26	Manufacture of Other Non-Metallic Mineral products	48.03	25.72	13.62	14	5.34	7
27	Manufacture of Basic Metals	70.76	11.77	6.18	-2.41	-1.68	-1.72
28	Manufacture of Fabricated Metal Products, Except Machinery and Equipment	71.1	31.87	28.09	8.99	4.2	5.11
29	Manufacture of Machinery and Equipment, n.e.c.	41.88	1.65	2.31	-0.24	-0.14	-0.08
31	Manufacture of Electrical Machinery and Apparatus, n.e.c.	9.6	12.76	7.42	-2.08	-0.54	-0.68
33	Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks	19.96	21.05	15.6	-1.02	-0.55	-0.59
34	Manufacture of Motor Vehicles, Trailers and Semi-Trailers	25.5	26.31	19.6	18.55	15.84	15.7
36	Manufacture and Repair of Furniture	1.3	13.59	13.69	27.99	15.96	16.33
37	Manufacturing , n.e.c.	-58.73	13.45	9.61	-1.23	-0.71	-0.75

In absolute terms, the average EPR for all industries is already low. However, the average figures hide a lot of variations. The country's effective protection has continued to discriminate in favor of some industries and against others, and in favor of sales in the domestic market against sales in other markets. This implies that there is a strong incentive to misallocate resources. There are two elements of bias in the effective protection structure, one is the bias in favor of agriculture and food manufacturing, and two, anti-export bias (artificial incentive to produce for the domestic market) or penalty imposed on exports as they continue to receive negative protection. That these industries have continued to survive suggests that they are economically efficient. This is in contrast to those sectors that have received relatively higher protection but have not exported to any significant extent. To address the problem of exporters being disadvantaged by the system of protection, the government has provided incentive mechanisms such as duty drawbacks, bonded manufacturing warehouses, and export processing zones to allow exporters duty-free importation of inputs.

2.3. Exports and Imports

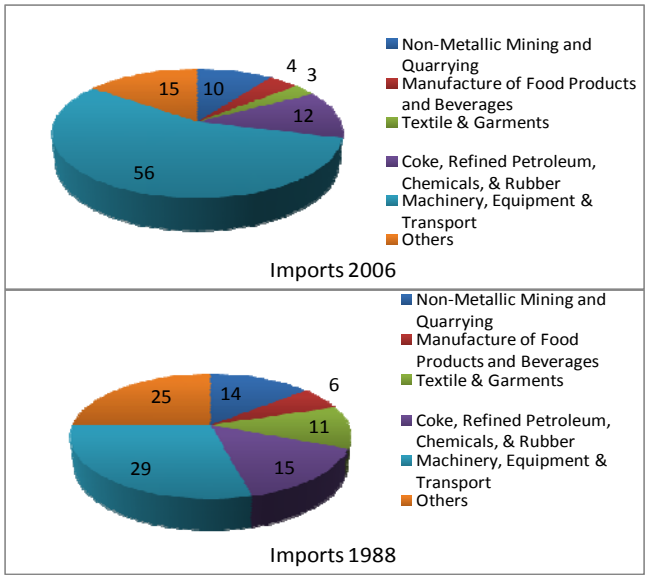
Figures 3A and 3B present the structure of exports and imports by 2-digit level PSIC. In 1988, 60% of our exports consisted of electrical machinery & apparatus, nec (22%), food and beverages (17%), and wearing apparel and textile (21%). Over the years, however, the Philippine export base has become less diversified. In 2006, 69% of the country's exports relied on only 1 sector: machinery equipment & transport. Meanwhile, the shares of traditional exports such as food and beverages along with wearing apparel and textile, declined to 3% and 7%, respectively.

Figure 3A. Merchandise Export Structure 1988 and 2006



In 1988, Philippine imports were composed of machinery equipment & transport which represented the bulk of the total with a share of 29%, chemicals had a share of 15%, while non-metallic mining & quarrying had 14%. Textiles and garments registered a share of 11% and food and beverages had 6%. Following the changes in the country's export structure, in 2006, the share of machinery & transport increased significantly to 56% while non-metallic mining & quarrying share declined to about 10%, chemicals also dropped to 12% and textiles & garments dropped to 3%.

Figure 3B. Merchandise Import Structure 1988 and 2006



Source: Foreign Trade Statistics, National Statistics Office.

2.4. Overall Manufacturing Performance and Structure

Table 6 presents the value added growth rate from the 1980s to the 2000s. The share of the industrial sector to total output decreased from its peak of about 28 % in the 1980s to roughly 26% during the 1990s and the 2000s. Within the industrial sector, the manufacturing sub-sector represents the most important sub-sector, accounting for about 26% of the total output in the 1980s, 25% in the 1990s, and 24% in the 2000s.

Table 6. Average Value Added Growth Rates and Structure

Year	Average Growth Rate			Average Value Added Share		
	1980-89	1990-99	2000-08	1981-89	1990-99	2000-08
Agric, Fishy, &Forestry	1.3	1.5	3.9	**23.5**	**21.6**	**19.3**
Industry Sector	0.9	2.1	4.7	**27.6**	**26.4**	**25.5**
Mining & Quarrying	3	-1.4	11.8	1.7	1.3	1.5
Manufacturing	0.9	2.3	4.3	**25.9**	**25.1**	**24**
Service Sector	2.3	3.7	5.5	**48.9**	**52**	**55.1**
Construction	-1.4	2.9	3.8	7.5	5.6	4.6
Electricity, Gas and Water	5.3	5.3	4.4	2.6	3.1	3.2
Transport, Com'n & Storage	3.7	4.4	8.3	5.3	6	8.2
Trade	3	3.5	5.6	13.9	15.3	16.6
Finance	2.3	5.6	6.9	3.5	4.4	5.2
Real Estate	2.5	2.2	3.7	5.4	5.5	4.7
Private Services	5.5	3.6	6.8	6.3	7	8
Government Services	3.2	3.6	2.6	4.6	5.2	4.6
TOTAL GDP	**1.7**	**2.8**	**5**	**100**	**100**	**100**

Source: National Income Accounts, NSCB.

The share of agriculture, fishery, and forestry has gradually declined from around 24% in the 1980s to 22 % in the 1990s and to 19% in the 2000s. The services sector has been the best performer in all three decades. However, in the most recent period, both agriculture and industry posted average growth of 3.9% and 4.7%, respectively. The services average growth rate increased continuously from 2.3% in the 1980s to 3.7% in the 1990s and 6% in the 2000s.

In terms of employment contribution, the services sector has become the largest provider of employment in the most recent period (Table 7). The share of the labor force employed in the sector consistently increased from around 40% in the 1980s to 47% in the 1990s and to 53 % in 2000-2008. The share of industry to total employment

has been almost stagnant from the 1980s to 1990s and dropped to 9.8% in the most recent period. Manufacturing has not generated enough employment to absorb new entrants to the labor force. Its share dropped from 10% during the 1980s-1990s to 9.5% during the years 2000-2008. While the share of agriculture has been declining, the sector has remained an important source of employment.

Table 7. Employment Growth Rate and Structure

Economic Sector	Average Growth Rate			Average Share		
	1981-89	1990-99	2000-08	1980-89	1990-99	2000-08
Agriculture, Fishery and Forestry	**1.2**	**0.7**	**1.8**	**49.6**	**42.8**	**37**
Industry	2.5	1.7	0.7	10.6	10.6	9.8
Mining and Quarrying	5.3	-4.6	8.7	0.7	0.5	0.4
Manufacturing	**2.5**	**2.1**	**0.4**	**9.9**	**10.2**	**9.5**
Services	**4.8**	**4.2**	**3.3**	**39.8**	**46.6**	**53.2**
Electricity, Gas and Water	**5.7**	**5.7**	**-0.9**	**0.4**	**0.4**	**0.4**
Construction	**4.9**	**5.3**	**2.8**	**3.5**	**5**	**5.1**
Wholesale & Retail Trade	6.2	3.8	4.5	12.5	14.6	18.2
Transport, Storage &Com	4.9	6.1	3.1	4.4	5.9	7.4
Finance, Ins, Real Estate & Business Services	3.2	6.2	7.8	1.8	2.2	3.2
Community, Social & Personal Services	4.1	3.6	2	17.1	18.5	18.8
TOTAL EMPLOYED	2.7	2.5	2.5	100	100	100

Source: National Income Accounts, NSCB.

Table 8 compares the levels and trends in the productivity of labor across the different economic sectors from the 1980s to the current period. The results indicate that labor productivity is low, and disparities across the three major sectors are wide. Industry has the highest labor productivity, which declined from the 1980s to the 1990s but with significant improvement in the current period. The average labor productivity in manufacturing declined between the eighties and the nineties, however, an increase is observed in the 2000s as the sector registered an average level of 94,598 pesos.

Table 8. Average Labor Productivity (in Pesos at 1985 Prices)

Economic Sector	1980-89	1990-99	2000-08	1980-89	1990-99	2000-08
Agriculture, Fishery, & Forestry	**15180**	**15940**	**19184**	**0.2**	**0.9**	**2.1**
Industry Sector	**83770**	**78536**	**96595**	**-1.4**	**0.6**	**4**
Mining & Quarrying	82202	92967	149166	3.9	4.9	4.8
Manufacturing	83984	77976	94598	-1.5	0.5	4
Service Sector	**39705**	**35237**	**37848**	**-2.3**	**-0.5**	**2.3**
Electricity, Gas and Water	**230344**	**218604**	**311680**	**2.4**	**0.2**	**6.6**
Construction	**70613**	**35403**	**32580**	**-6.2**	**-1.9**	**1.4**
Trade	35793	33010	33289	-2.8	-0.2	1.4
Transportation, Communication & Storage	38101	32759	40517	-0.8	-1.5	5
Financing, Insurance, Real Estate & Business Services	159772	142512	113441	-0.1	-2.1	-1.6
Community, Social & Personal Services	20222	20731	24414	0.4	0.1	3.2
TOTAL GDP	32100	31524	36654	-1	0.4	2.5

Source: National Income Accounts, NSCB and Labor Force Survey, NSO.

Table 9 shows a more detailed structure of the value manufacturing added. Consumer products such as food manufacturers and beverage industries continue to dominate the sector, although its share dropped from 57 % in the 1980s to 50 % during the 1990s up the current period. The share of intermediate goods such as petroleum and coal products and chemical and chemical products accounted for 31 % in the 1980s. This increased to 35 % in the 1990s but fell to only 27 % in the recent period. The share of textile manufacturers dropped continuously from 4 % to 2 % between the 1980s and 2000s.

Table 9. Average Value Added Structure and Growth

Industry Group	Average Growth Rate			Average Value Added Share		
	1980-89	1990-99	2000-08	1981-89	1990-99	2000-08
Consumer Goods	**0**	**2**	**5**	**57**	**50**	**50**
Food manufactures	-1	2	6	44	36	39
Beverage industries	7	2	4	4	4	4
Tobacco manufactures	1	1	-6	3	3	1
Footwear wearing apparel	6	2	2	5	6	5
Furniture and fixtures	2	2	7	1	1	1
Intermediate Goods	**2**	**2**	**2**	**31**	**35**	**27**
Textile manufactures	0	-5	0	4	3	2
Wood and cork products	-5	-4	-4	2	2	1
Paper and paper products	4	-1	2	1	1	1
Publishing and printing	3	1	0	1	2	1
Leather and leather prod.	-3	5	0	0	0	0
Rubber products	1	-2	0	2	1	1
Chemical & chemical	-1	2	3	7	6	6
Petroleum & coal	6	4	3	12	17	14
Non-metallic mineral	2	2	3	2	3	2
Capital Goods	**2**	**6**	**6**	**10**	**13**	**19**
Basic metal industries	10	-2	13	3	2	2
Metal industries	4	0	7	2	2	2
Machinery ex. electrical	0	6	2	1	1	2
Electrical machinery	7	13	6	3	6	12
Transport equipment	-5	2	5	1	1	1
Miscellaneous manufactures	8	5	7	2	2	3
Total Manufacturing	1	2	4	100	100	100

Source: National Income Accounts, National Statistical Coordination Board.

The share of capital goods increased substantially from 10 % in the 1980s to 19 % in the 2000s. This shift may be attributed to the growing importance of the electrical machinery sub-sector whose share rose from 3 % in the 1980s to 12 % in the 2000s. The share of transport equipment, meanwhile, remained constant at 1 % during the periods under study. In terms of growth, capital goods grew at an average rate of 2 % during the 1980s. In the 1990s and 2000s, it posted an average rate of 6 % in each period. Intermediate goods registered a growth rate of 2 % in each period under study, while consumer goods growth rate increased from 2 % in the 1990s to 5 % in the recent period.

3. Review of Philippine Literature on the Link between Manufacturing Trade and Productivity

The Philippine Institute for Development Studies carried out a number of trade studies examining the impact of trade liberalization on resource allocation (Medalla *et al.*, 1995; Tan, 1997; Pineda, 1997; and Medalla, 1998). The results of these studies are summarized in Medalla (1998). Using effective protection rates (EPR) as trade policy variable and domestic resource costs (DRC) as resource allocation variable, Medalla (1998) concluded that trade reforms have a positive and significant effect on resource allocation. The DRC calculations showed that between 1983 and 1992, the reduction in effective protection rates in the manufacturing industry were accompanied by a substantial reduction in the average domestic resource costs. Moreover, the share of efficient manufacturing firms increased considerably while the share of the inefficient ones declined in terms of both value of output and number of firms. In terms of value added, the share of efficient industry sectors rose while the share of inefficient sectors dropped. These results are clear indications that the previous trade reforms resulted in a more efficient resource allocation as resources moved from inefficient activities towards more efficient ones.

Studies on trade and productivity are few and mostly based on macro level analysis with total factor productivity calculations obtained using the growth accounting framework. These studies focus mainly on the effects of increased trade on productivity. Kajiwara (1994) regressed export growth and TFP growth covering the period 1984-1988. The results showed a negative and highly significant coefficient on the TFP growth rate which indicated that improving productivity does not lead to increases in exports. Kajiwara explained that while trade liberalization made the domestic market more competitive and improved the structural efficiency of the manufacturing industry, the core of manufactured exports remained dominated by consignment manufacturing, a production activity which had very little linkage with the domestic industry.

Urata (1994) examined the impact of trade liberalization and foreign direct investment on productivity in the Philippines as part of a cross-country study including

Korea, Taiwan, Thailand, Malaysia, Indonesia, and India. Using TFP and nominal and effective tariff rates as measures of level of protection, the study found that for five countries, Korea, Thailand, Malaysia, Indonesia, and Philippines; trade liberalization has a positive impact on TFP growth, but the relationship is not always stable or statistically significant.

Austria (1998) and Cororaton and Abdula (1999) looked at the determinants of TFP with exports and imports among the explanatory variables. Cororaton and Abdula used lagged values of imports and exports while Austria used imports and exports as a percentage share of GDP. The results of both papers showed that the coefficient on exports is positive and insignificant; however, the coefficient on imports is negative and highly significant. Cororaton and Abdula explained that the highly significant negative impact of imports on productivity was due to the inappropriateness of the technology adopted by industries and failure to integrate it with the forward and backward linkages of the economy, and to ensure proper use of resources. Meanwhile, Austria pointed out that the country's imports of machinery and transport equipment, which embody the production techniques necessary to increase productivity, account for a small proportion of total imports. Moreover, Austria noted that the lack of manpower skills to operate these machines has led to declining productivity.

Hallward-Driemeier, M. *et al.* (2002) conducted a cross-country study covering the Philippines, Indonesia, Korea, and Thailand to examine the patterns of manufacturing productivity. The study used plant-level data based on a survey conducted in the late 1990s. This covered, for the Philippines, 424 registered firms with at least 20 employees in the food, textile, garment, chemical, and electronic sectors. TFP was derived from a Cobb-Douglas production function based on two specifications, Levinsohn-Petrin and the more conventional OLS procedure. Their results show that exporters are significantly more productive than non-exporters that sell only in the domestic market and the productivity gaps are larger the less developed the domestic market is (Philippines and Indonesia). The results also show that access to world markets leads firms to undertake investments that increase their productivity and these effects are more powerful in economies with product markets that are less well-integrated.

4. Empirical Framework and Data Description

4.1. Methodology

Following Pavcnik (2000), the paper will first estimate total factor productivity using the methodology of Levinsohn and Petrin (2003). Second, the estimated aggregate TFP is decomposed to understand the factors that underlie the changes in TFP growth and examine the importance of the contribution of resource reallocation within industries to productivity growth. Third, the correlation between trade liberalization and productivity is examined in a regression framework by industry trade orientation and by using effective protection rate as a trade proxy. Pavcnik used dummy variables as a measure of trade policy. In the case of the Philippines, applying trade orientation dummy variables might not correctly capture the changes in tariffs and protection since the trade liberalization program was carried out in various stages at an uneven pace across industries from the early 1980s to the 1990s. This is different from Chile's trade liberalization experience that occurred in one big bang from 1974 to 1979 with the adoption of a uniform 10% tariff in 1979. In other studies that measure the impact of trade liberalization on productivity, nominal tariffs are applied. Amiti and Konings (2004) used both input and output tariffs in Indonesia while Topalova (2003) employed nominal tariffs on finished goods in India.

Effective protection rates take into account both the tariff on the firm's output and the tariffs on the inputs that the firm uses. EPRs are important because tariffs vary considerably along the production stage generally exhibiting an escalating structure with inputs having lower protection while final goods receive higher protection. For instance, in 2004, the tariff rate on completely knocked down (CKD) packs was 3%, the average tariff rate on other parts and components was about 5% while the tariff rate on completely built units (CBUs) was 30%. The calculated EPR was around 76%.

In the analysis of the impact of trade liberalization on productivity, a firm-level panel dataset covering an eight-year period from 1996 to 2006 is employed (1999, 2001 and 2004 are missing). As earlier discussed, major tariff reform programs were implemented in 1980, 1991, and 1995. The first major step towards the plan to adopt a uniform 5 % tariff by 2005 started in 1995. In 1996, the government legislated the

tariffication of quantitative restrictions imposed on agricultural products and the creation of tariff quotas. Note, that these are inputs to food manufacturing. Further reforms were pursued in 1998, although these were not implemented as the government adopted a policy of selective protection.

Domestic firms are differentiated depending on the trade orientation of their industry sector. Each industry sector is classified into traded or non-traded, based on the sector's import penetration ratio and export intensity ratio calculated from the 2000 Input-Output Table. Appendix 1 contains a complete list of manufacturing sectors by trade orientation. A sector is classified as non-traded if export and import ratios are zero or less than 1%, such as slaughtering and meat packing, ice cream, mineral water, and custom tailoring and dressmaking. A traded sector is categorized into three: purely importable, purely exportable, or mixed.

A purely exportable sector is characterized by zero or minimal imports and substantial exports or an export ratio of at least 10 %. Examples are tobacco leaf flue-curing, articles made of native materials, wood carvings, fish drying, knitted hosiery, crude coconut oil, rattan furniture, and jewelry. A purely importable sector is characterized by minimal exports and significant imports or an import ratio of at least 10 %. This includes meat and meat products, coffee roasting and processing, butter and cheese, animal feeds, starch and starch products and the manufacture and assembly of motor vehicles. A mixed sector has substantial imports and exports such as motor vehicle parts and components, semi-conductors, parts and supplies for radios, tvs, communication appliances and house wares, garments, carpets and rugs, furniture, along with sugar, glass, chemicals, cigarettes, soap and detergents, iron and steel, and drugs and medicines. Notice that a lot of the products under both the mixed and purely importable sectors are also among the tariff peak products (refer to section II.B). Moreover, aside from tariff protection, certain products under these sectors also received additional protection through safeguard measures that are imposed on importation of cement, glass, chemicals, and ceramic tiles.

4.1.1. TFP Estimation

Total factor productivity or TFP, defined as the residual of a Cobb-Douglas production function, is used as the performance measure. To address the simultaneous

problem in the input choice when estimating the production function by ordinary least squares (OLS)[3], a semi-parametric estimator with an instrument to control for unobserved productivity shocks is applied. For this instrument, Olley and Pakes (1996) use investment while Levinsohn and Petrin (2003) suggest the use of intermediate inputs. Due to the large number of missing investment observations, the Levinsohn and Petrin approach is applied in the analysis.[4] Given the availability of fuel and electricity data, this variable is employed as a proxy for productivity shocks.

In order to estimate the production function, data on value added (output less cost of materials and energy) and two factors of production, labor and capital, are used. All variables are expressed in logarithmic form. The production function estimated for firm i in industry j at time t is written as:

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \mu_{it} \quad \text{Equation (1)}$$

where y_{it}: log of output (measured as value added) in year t

k_{it}: log of firm i's capital stock

l_{it}: log of labor input

μ_{it}: error term which is assumed to be additive in two unobservables, ω_{tt} and η_{it}. This can be written as $\mu_{it} = \omega_{it} + \eta_{it}$ where ω_{it} is an efficiency term (or productivity level) known by the firm[5] but not by the econometrician. η_{it} is an unexpected productivity shock with zero mean unobserved by both the firm and the econometrician.

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[3] The problem with this approach was pointed out in Marschak and Andrews (1944). They noted that plants with large positive productivity shock may respond by using more inputs. To the extent that this occurs, OLS estimates of production functions will yield biased estimates and by implication, biased estimates of productivity. The usual solution to this econometric endogeneity is to use an instrumental variables estimator. Olley and Pakes applied semi-parametric econometric methods to solve the endogeneity problem.

[4] The Olley and Pakes methodology can only be applied to firms reporting non-zero investment. This usually leads to a sizeable number of observations that must be dropped from the estimation because they violate the strict monotonicity condition necessary for the validity of the Olley and Pakes procedure. The Levinsohn and Petrin approach avoids this problem.

[5] The fact that ω_{it} is known by the firm when it takes the decision whether to stay in the market and produce, and if deciding to produce, which input combination to use, makes the OLS estimate of the production function biased. The error term is not uncorrelated with the explanatory variables, the key assumption for OLS to produce unbiased estimates. There is not only a simultaneity bias but also a selection bias. The former is due to the fact that unobserved efficiency level is taken into account when the firm decides what input combination and quantities it will produce. The latter is attributed to the fact that the firm chooses whether to stay in the market or exit after it knows its productivity level ω_{it} that is unobservable to the econometrician. (See Schor, 2003).

Using equation (1), a production function is estimated for 11 industry-sectors with the Levinsohn and Petrin methodology. The estimates of firm i's TFP is obtained by subtracting firm i's predicted y from its actual y at time t. To make the estimated TFP comparable across industry-sectors, a productivity index is created. Following Pavcknik (2000), the index is obtained by subtracting a productivity of a reference firm in a base year from an individual firm's productivity measure:

$$prod_{it} = y_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_l l_{it} - (y_\tau - \hat{y}_\tau) \quad \text{Equation (2)}$$

Where

$$y_\tau = \bar{y}_{it} \text{ and } \hat{y}_\tau = \hat{\beta}_k \bar{k}_{it} + \hat{\beta}_l \bar{l}_{it}$$

The bar over a variable indicates a mean over all firms in a base year. Here, 1996 is used as base year. Hence, y_τ is the mean log output of firms in the base year 1996 and $\hat{y}_\tau$ is the predicted mean log output in 1996. This productivity measure represents a logarithmic deviation of a firm from the mean industry in a base year.

4.1.2. TFP Decomposition

To see whether the reallocation of resources and outputs from less to more efficient firms contributes substantially to productivity gains, aggregate productivity measures are computed for each year and decomposed as follows:

$$\Omega_t = \sum_i s_{it} prod_{it} = \overline{prod}_t + \sum_i (s_{it} - \bar{s})(prod_{it} - \overline{prod}_t) \quad \text{Equation (3)}$$

The bar over a variable denotes a mean over all firms in a given year. Ω_t is the industry-level productivity and is a weighted average of firm-level productivities, s_{it} is firm i's weight in year t and $prod_{it}$ is the estimate of firm-level productivity.

In the decomposition, the first term represents the part of industry-level productivity growth due to within plant productivity growth. The second term, a covariance term, captures the reallocation effect as output shares are reallocated from less productive to more productive firms. A positive covariance term indicates that more output is produced by the more efficient firms. If trade liberalization induces reallocation of

resources within industries from less to more productive firms, the covariance term should be positive and increasing over time.

4.1.3. Trade and Firm-level Productivity Link

To examine the impact of trade liberalization on productivity, the following regression framework is employed:

$$prod_{it} = \alpha_0 + \alpha_1 trlib + \alpha_2 z_{it} + \varepsilon_{it} \quad \text{Equation (4)}$$

where *Prod* is the total factor productivity measure for firm i at time t relative to an average firm in firm i's industry in the base year. *Trlib* is trade policy variable proxied by nominal tariff and effective protection rates. Z_{ikt} is a set of firm characteristics including employment as a size measure and firm exit indicator. Time trend, industry indicators, and firm indicators will be included in the regression. To directly explore the relationship between trade liberalization and firm productivity, the firms are pooled based on their trade orientation. A negative sign on *Trlib* is expected indicating that lower protection is associated with higher productivity. This provides evidence that trade liberalization leads to productivity gains among domestic manufacturers differentiated into four groups: purely importable, purely exportable, mixed, and non-traded.

Trade liberalization affects both final and input tariffs. Reducing tariffs on final goods will increase competition forcing firms to trim their fat, reduce agency problems and adopt innovative processes leading to productivity increases. Reducing tariffs on inputs will enable firm's access to high quality intermediate goods and to adopt new production methods leading to efficiency increases. The effective protection rate tries to capture both effects.

Gains from trade liberalization could also arise from reallocation effects with more efficient firms gaining market share and increasing average industry productivity. The coefficient on the exit indicator is thus expected to be negative, indicating that exiting firms have lower productivity than continuing firms.

4.2. Data

The data used in the paper are from the Annual and Census of Establishments of the National Statistics Office. The Census of Manufacturing Establishments is conducted every five years and includes all manufacturing establishments. The Annual Survey is conducted annually and covers a subsample of firms in operation. The establishment or firm refers to an economic unit engaged, under single ownership or control, in one or predominantly one kind of economic activity at a fixed single location. The datasets contain consistent firm level information on revenues, employment, compensation, physical capital, and production costs. Data on exports and foreign capital participation are not consistently reported.

Firms are categorized by industry according to the 5-digit Philippine Standard Industrial Classification (PSIC) of 1994. However, datasets prior to 1998 used the 1977 PSIC. The 1994 PSIC Code introduced new sectors by breaking-up previously aggregated codes. At the same time, it also combined together certain sectors which used to be classified under separate codes in the 1977 PSIC. To match the 1977 and 1994 Philippine Standard Industrial Classification (PSIC) Codes, a common standard coding system was created. The amended 1994 PSIC of the National Statistical Coordination Board was used as a basis in coming up with the harmonized codes.

The panel dataset is created by linking the establishment control numbers (ECNs) or identification codes of firms. However, due to changes in firm ECNs in 1996, datasets prior to this year could not be matched with the data from 1996 onwards. The firm-level panel dataset built covers the period 1996 to 2006, with three missing years in between (1999, 2001, and 2004). The years 2000 and 2006 are both census years while the remaining six years are surveys. The panel dataset is unbalanced and covers all firms with two or more overlapping years during the period 1996-2006. Firms with missing zero or negative values for the variables used to estimate TFP as well as those with duplicates were dropped. Firms with less than 10 workers were also excluded. Firm exit is indicated by firms that are no longer included in the 2006 census as well as those whose 2-digit PSIC codes have changed. Initially, the number of observations totaled 27,818 but after removing observations with missing or negative values as well as duplicates, the total was reduced to 22,500 (see Appendix 2).

The data on economic activity are complemented with annual effective protection

rates (EPRs). These used were sourced from Manasan and Pineda (1999) for EPRs covering the 1990s and Aldaba (2005) for EPRs in the more recent period. The calculated EPRs in these papers are all coded based on the Input-Output codes. In determining the trade orientation of industries (traded or non-traded), the 2000 input-output table is used on the basis of sector level exports, import, and total output.

5. Trade Protection and Productivity: What Can Be Learned from Micro Data?

5.1. TFP and TFP Decomposition

The analysis is based on an unbalanced panel dataset covering eight years during the period 1996 to 2006. Table 10 presents the variables and descriptive statistics. Value added by sector was deflated using the gross domestic product (GDP) by industrial origin implicit price index, for capital assets, GDP fixed capital formation index was used, and for fuel and electricity, the wholesale price index for fuel, lubricants and related materials was applied. Table 11 shows the estimates of the coefficients of the production function using the Levinsohn-Petrin method. These input coefficients are then applied to construct a measure of firm productivity. For each year, the aggregate industry productivity measures are calculated. These are then decomposed into two components: (i) within firm productivity and (ii) reallocation of resources and market shares from less to more efficient firms.

Table 10. Descriptive Statistics

Variable	Definition	Obs	Mean	Std. Dev.
Tot workers	Total number of workers	22500	259.4827	627.1911
Capital	Book value of assets	22500	157000000	889000000
Value added	Output –(raw materials+electricity& fuel)	22500	202000000	1260000000
Fuel elect	Fuel and electricity	22500	33100000	1550000000
Epr	Effective protection rate	22500	8.450309	15.97052
Tar	Tariff rate	22500	12.42712	8.913147

Table 11. Estimated Production Functions

Sector	Description	Capital	Labor
1	Food, beverages, tobacco	0.1209807***	0.5496299***
	Standard error	0.0277454	0.0273871
	Number of observations	4754	
2	Textile	0.1213055***	0.75908***
	Standard error	0.0340724	0.038312
	Number of observations	1149	
3	Garments	0.1652882***	0.6739292***
	Standard error	0.0505077	0.0267207
	Number of observations	2215	
4	Leather & leather products	0.3313098***	0.7494902***
	Standard error	0.1181212	0.0578855
	Number of observations	568	
5	Wood, paper products, & publishing	0.1295727***	0.5809723***
	Standard error	0.0394782	0.0346143
	Number of observations	2452	
6	Coke, petroleum, chemicals, rubber & plastic	0.1442959***	0.6266484***
	Standard error	0.0406107	0.0419769
	Number of observations	2794	
7	Non-metallic products	0.1944391***	0.5718431***
	Standard error	0.070396	0.0478595
	Number of observations	1031	
8	Basic metals & fabricated metal	0.1101153**	0.5723843***
	Standard error	0.0496199	0.0415097
	Number of observations	1943	
9	Machinery, equipment & transport	0.1007086***	0.6016929***
	Standard error	0.0292542	0.0220874
	Number of observations	4090	
10	Furniture	0.2238909***	0.6444838***
	Standard error	0.0815305	0.0400102
	Number of observations	844	
11	Other manufactured products	0.0327132	0.7433052***
	Standard error	0.1006939	0.0586069
	Number of observations	660	

Note: * 10% level of significance, **5% level of significance, ***1% level of significance.

Table 12 presents the results of the decomposition in terms of the contribution of unweighted productivity and covariance growth (between output and productivity) to aggregate productivity growth. The unweighted productivity component is a measure of

within firm productivity growth while the covariance component measures the reshuffling of resources in favor of more productive firms. The growth figures are normalized and interpreted as growth relative to 1996. From 1996 to 2006, aggregate productivity gains are evident in leather, textile, furniture, other manufacturing, and basic metals and fabricated metal sectors. Leather grew by 9.5%, textile by 2.4%, other manufacturing by 2.9%, furniture by 1.9% and basic metals by 1.3%. In these sectors, growth was driven mainly by growth in the covariance component indicating a reallocation of market shares and resources from the less productive to the more productive firms. In the leather sector, the covariance grew by 17%, 6.3% in other manufacturing areas, 4.6% in textile, 2% in basic and fabricated metal, and 1.7% in furniture. Except for furniture, all the sectors posted negative unweighted mean productivity growth.

Table 12. Aggregate Productivity Growth Decomposition

Code	description	Year	Aggregate productivity	Unweighted productivity	Covariance
1	food, beverages, & tobacco	1996	0	0	0
		1997	0.4456	0.54735	-0.10168
		1998	3.0068	2.59885	0.40802
		2000	-0.8192	0.70045	-1.51967
		2002	-1.8349	0.80495	-2.63986
		2003	-2.2529	1.40055	-3.65345
		2005	-1.3558	-0.11777	-1.23805
		2006	-1.4387	-1.93472	0.49602
2	textile	1996	0	0	0
		1997	1.7962	0.71022	1.08594
		1998	1.011	0.84162	0.16932
		2000	0.9479	0.29292	0.65497
		2002	-0.4619	-0.21031	-0.25165
		2003	1.1993	0.49042	0.7088
		2005	6.0031	-0.71472	6.71781
		2006	2.3518	-2.26561	4.61733

(Table 12. *Continued*)

Code	description	Year	Aggregate productivity	Unweighted productivity	Covariance
3	garments	1996	0	0	0
		1997	1.1206	0.647	0.47361
		1998	2.4573	1.1334	1.32394
		2000	0.5061	0.9195	-0.4134
		2002	0.4899	-1.69075	2.18071
		2003	0.6202	-0.34748	0.96772
		2005	-0.746	-1.9897	1.24373
		2006	-0.9928	-2.5954	1.60258
4	leather	1996	0	0	0
		1997	-1.34725	0.1061	-1.45333
		1998	0.8141	-0.9926	1.80669
		2000	0.634	-2.0482	2.68219
		2002	7.197	-3.1659	10.36288
		2003	12.1027	-4.82032	16.92295
		2005	8.0915	-5.75065	13.8421
		2006	9.5435	-7.69629	17.23975
5	wood, paper, & publishing	1996	0	0	0
		1997	0.6098	-0.18835	0.79821
		1998	0.286	0.6708	-0.3848
		2000	-2.4618	-1.72184	-0.73992
		2002	-1.0602	-1.1114	0.05119
		2003	-3.8456	-0.20203	-3.64358
		2005	-3.6436	-1.32284	-2.32074
		2006	-5.3884	-1.40469	-3.98371
6	coke, petroleum, chemicals & rubber	1996	0	0	0
		1997	-0.611	0.3368	-0.94784
		1998	-2.6792	-0.86638	-1.81286
		2000	2.9396	-0.04676	2.98633
		2002	-6.6506	-0.67928	-5.97139
		2003	4.1851	-1.66832	5.85343
		2005	-1.1094	-2.58193	1.47251
		2006	-4.7642	-2.13054	-2.63366
7	non-metallic products	1996	0	0	0
		1997	0.1131	-0.05724	0.17031
		1998	1.4701	0.5215	0.94862
		2000	-1.1175	0.3424	-1.46001
		2002	-7.3836	-2.00975	-5.37392
		2003	-2.196	1.2883	-3.48432
		2005	0.3894	-0.66352	1.05283
		2006	-0.6473	-2.37125	1.72388

(Table 12. *Continued*)

Code	description	Year	Aggregate productivity	Unweighted productivity	Covariance
8	basic metal & fabricated metal products	1996	0	0	0
		1997	-0.2004	1.32661	-1.52696
		1998	-4.3883	0.24961	-4.63793
		2000	-1.7683	0.17731	-1.94565
		2002	-3.1787	-1.16508	-2.01367
		2003	-2.7001	0.72681	-3.42692
		2005	-4.4682	-0.05965	-4.40855
		2006	1.3205	-0.70002	2.02053
9	machinery & equipment, motor vehicles & other transport	1996	0	0	0
		1997	0.3735	1.05154	-0.67812
		1998	-4.9195	1.36814	-6.28774
		2000	0.9015	0.50724	0.39427
		2002	-2.004	1.88764	-3.89168
		2003	-2.7507	2.97624	-5.72693
		2005	-1.6976	2.07454	-3.77218
		2006	-0.858	0.82884	-1.68693
10	furniture	1996	0	0	0
		1997	1.1589	0.43804	0.7209
		1998	1.6444	0.50134	1.14312
		2000	3.1225	-0.83565	3.95822
		2002	3.4577	0.18164	3.2761
		2003	2.0269	0.81994	1.20695
		2005	2.5903	-0.14386	2.73416
		2006	1.864	0.20054	1.66347
11	Other manufacturing	1996	0	0	0
		1997	-0.1807	-0.34956	0.16884
		1998	3.0145	0.53862	2.47583
		2000	0.2715	-1.56496	1.83647
		2002	1.4867	-1.05729	2.54396
		2003	0.6263	-2.15807	2.78441
		2005	1.1844	-3.02796	4.21237
		2006	2.8653	-3.44865	6.31391
	All manufacturing	1996	0	0	0
		1997	-0.2289	0.52691	-0.75581
		1998	-1.5939	0.94821	-2.54213
		2000	-0.4444	0.04361	-0.48812
		2002	-4.8621	-0.20471	-4.65744
		2003	-1.0019	0.61681	-1.61874
		2005	-2.5331	-0.62714	-1.90597
		2006	-3.3701	-1.47782	-1.89236

(Table 12. *Continued*)

Code	description	Year	Aggregate productivity	Unweighted productivity	Covariance
	Non-traded (NT)	1996	0	0	0
		1997	1.0615	1.0713	-0.0099
		1998	-2.0268	0.6031	-2.63
		2000	1.7744	1.9616	-0.1872
		2002	1.2714	1.8996	-0.6282
		2003	3.7791	3.1779	0.6012
		2005	12.8997	3.8971	9.0026
		2006	3.9191	0.7626	3.1564
	Purely importable (PM)	1996	0	0	0
		1997	0.9131	0.6038	0.3093
		1998	2.1644	2.3049	-0.1404
		2000	-2.8248	0.0552	-2.8799
		2002	-4.4221	0.65	-5.072
		2003	-1.7409	2.3334	-4.0742
		2005	-1.5688	0.0233	-1.592
		2006	-0.9943	-0.9624	-0.0318
	Purely exportable (PX)	1996	0	0	0
		1997	4.7958	1.0313	3.7645
		1998	12.0972	2.7059	9.3914
		2000	4.2568	0.1134	4.1434
		2002	9.1702	0.0232	9.147
		2003	4.2675	0.0232	4.2443
		2005	3.479	-0.5855	4.0645
		2006	3.7554	-1.2888	5.0442
	Mixed sector (MX)	1996	0	0	0
		1997	-0.4724	0.437	-0.9094
		1998	-2.524	0.7156	-3.2397
		2000	0.0477	-0.0164	0.0641
		2002	-5.3206	-0.3946	-4.9259
		2003	-1.099	0.3881	-1.4871
		2005	-3.0772	-0.8372	-2.24
		2006	-3.9225	-1.5295	-2.3931

Out of the 11 manufacturing sectors, six sectors covering food, beverages, tobacco, garments, wood, paper, and publishing; coke, petroleum, chemicals and rubber; non-metallic products; basic metal and fabricated metal products as well as machinery and equipment, motor vehicles and other transport registered negative productivity growth rates from 1996 to 2006. On the whole, the manufacturing sector's aggregate

productivity declined by 3.4% from 1996 to 2006.

The manufacturing sector was divided into four groups: non-traded, purely importable, purely exportable, and mixed. Both the non-traded and purely exportable sectors posted positive growth rates from 1996 to 2006, most of which was contributed by growth in the covariance component. The non traded sector grew by 3.9% during this period, of which 3.2% was due to the reallocation of market share from less efficient to more efficient firms. The purely exportable sector grew by 3.8%, of which 5% was contributed by the reshuffling of market shares towards more efficient firms. The purely importable and mixed sectors declined by 1% and 3.9%, respectively from 1996 to 2006. In both groups, unweighted productivity growth and covariance growth rates were negative.

5.2. Impact of Trade Liberalization on the Different Groups: 1996-2006

To examine the direct effects of trade liberalization on productivity growth in the presence of firm heterogeneity, equation 4 is applied to the non-traded, purely importable, purely exportable and mixed sectors. Evidence points out that the reshuffling of output share and resources among firms with different productivity levels is an important source of trade-induced productivity gains (Melitz 2002). In particular, the productivity of firms exposed to international trade (exporters and import-competing firms) grew much more than that of firms in the non-traded sectors (Epifani 2003). As Chile's experience shows (Pavcnik 2000), the reallocation of resources and market share towards more productive firms is a critical determinant of productivity growth and this can be largely due to trade liberalization.

Melitz (2002) shows that trade can contribute to the Darwinian evolution of industries by forcing the least efficient firms to contract or exit while promoting the growth of the more efficient ones. Exposure to trade will induce only the more productive firms to enter the export market and will simultaneously force the least productive firms to exit, while the less productive firms continue to produce only for the domestic market. The entry of firms in response to the higher relative profits earned by exporters leads to the exit of the least productive domestic firms. Through trade liberalization, additional inter-firm reallocations towards more productive firms occur which can generate industry productivity growth, without necessarily affecting intra-

firm efficiency.

Tables 13, 14, and 15 present the results of the regression using pooled OLS, random effects, and fixed effects techniques respectively. Two trade policy proxies are applied, effective protection rate and nominal protection measured by tariff rate on finished goods. Using effective protection rate as trade proxy, Table 13 shows that based on pooled OLS technique, the coefficient on l*nepr* is negative and highly significant for the purely importable, mixed and non-traded sectors. For the purely exportable sector, a significant (at the 5% level) positive sign is obtained. This tends to imply that since exportable are penalized by the protection system, increasing their protection would improve the sector's productivity.

Table 13. Regression Results (Equation 4): OLS Method

	(1)EPR as trade proxy (*lnepr*)				(2)Tariff rate as trade proxy (*lntar*)			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	-0.122***	-0.076***	0.065***	-0.057***	-0.036***	-0.024***	0.002	-0.034***
	(0.036)	(0.015)	(0.028)	(0.009)	(0.010)	(0.003)	(0.013)	(0.002)
exit indicator	0.004	0.003	-0.001	-0.010***	0.003	0.005	-0.001	-0.010***
	(0.008)	(0.007)	(0.006)	(0.002)	(0.008)	(0.007)	(0.006)	(0.002)
lnworkers	0.051***	0.064***	0.041***	0.044***	0.051***	0.064***	0.041***	0.043***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
sector indicators	yes	yes	yes	yes	yes	yes	yes	yes
year indicators	yes	yes	yes	yes	yes	yes	yes	yes
firm indicators	no	no	no		no	no	no	no
R-squared	0.4117	0.3787	0.267	0.2887	0.4111	0.3854	0.2648	0.3033
N	1024	2296	1738	17442	1024	2296	1738	17442

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance.

NT: Non-traded, PM: Purely Importable, PX: Purely Exportable, MX: Mixed Sector.

With respect to the *exit indicator*, the coefficient is negative and highly significant only for the mixed sector. For the purely importable and non-traded sectors, the coefficient on *exit* is positive but insignificant. For the purely exportable sector, the coefficient is negative but not statistically significant. The coefficient on *lnworkers* is positive and highly significant for all groups.

Next, equation 4 is tested using the random effects method. In general, the same results are obtained as shown in Table 14. The coefficient on the trade variable, *lnepr*, is negative and highly significant for both purely importable and mixed sectors. It is also negative for the non-traded sector but insignificant. For the purely exportable sector, a positive sign is also obtained but is not statistically significant. The coefficient on the exit variable is negative and highly significant for firms in the mixed sector while the coefficient on *lnworkers* is positive and highly significant for all groups. A test for random effects was performed based on the Breusch and Pagan Lagrangian multiplier test. The result rejected the null hypothesis that random effects are not needed.

Table 14. Regression Results (Equation 4): Random Effects Method

	(1)EPR as trade proxy (*lnepr*)				(2)Tariff rate as trade proxy (*lntar*)			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	-0.049	-0.073***	0.037	-0.031***	-0.013	-0.024***	-0.004	-0.022***
	(0.043)	(0.017)	(0.027)	(0.009)	(0.011)	(0.005)	(0.012)	(0.002)
exit indicator	0.001	0.006	-0.0005	-0.006***	0.001	0.007	-0.0003	-0.007***
	(0.006)	(0.006)	(0.005)	(0.002)	(0.006)	(0.006)	(0.005)	(0.002)
lnworkers	0.046***	0.047***	0.033***	0.036***	0.046***	0.047***	0.033***	0.035***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.001)
sector indicators	yes		yes		yes	yes	yes	yes
year indicators	yes		yes		yes	yes	yes	yes
within	0.0721	0.0009	0.0004	0.0026	0.0711	0.0012	0.0002	0.002
between	0.3971	0.4028	0.2956	0.3451	0.3981	0.4007	0.2966	0.362
overall	0.407	0.3728	0.2652	0.2809	0.4064	0.379	0.2631	0.296
N	1024	2296	1738	17442	1024	2296	1738	17442
Breusch-Pagan Test	chi2(1) = 10314.56 Prob > chi2 = 0.0000				chi2(1) = 9850.85 Prob > chi2 = 0.0000			

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance.

NT: Non-traded, PM: Purely Importable, PX: Purely Exportable, MX: Mixed Sector.

Equation 4 is then estimated using the fixed effects method. The results in table 15 show that the coefficient on *lnepr* is negative and significant at the 5% level only for the purely importable sector. For the purely exportable, mixed and non-traded sectors, the coefficients are positive but not statistically significant. The coefficient on the *exit*

variable is negative and statistically significant only for the mixed sector. The coefficient on *lnworkers* is positive and highly significant for the mixed and non-traded sectors. For the purely importable sector, the coefficient on *lnworkers* is negative and highly significant indicating that relatively smaller firms are more productive. It also indicates that firms in the purely importable sector are downsizing to improve their efficiency. The Hausman test was applied and the result rejected the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator. This justifies the use of the results obtained through the fixed effects method.

Table 15. Regression Results (Equation 4): Fixed Effects Method

	(1)EPR as trade proxy (*lnepr*)				(2)Tariff rate as trade proxy (*lntar*)			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	0.059	-0.052**	0.036	0.007	0.024	-0.016	0.008	0.003***
	(0.067)	(0.030)	(0.042)	(0.014)	(0.019)	(0.010)	(0.015)	(0.004)
exit indicator	0.001	0.007	-0.003	-0.004**	0.001	0.008	-0.002	-0.004**
	(0.007)	(0.006)	(0.007)	(0.002)	(0.007)	(0.006)	(0.007)	(0.002)
lnworkers	0.034***	-0.002	-0.015***	0.005***	0.034***	-0.001	-0.015***	0.005***
	(0.009)	(0.007)	(0.008)	(0.002)	(0.008)	(0.007)	(0.008)	(0.002)
sector indicators	yes	yes	yes		yes	yes	yes	yes
year indicators	yes	yes	yes		yes	yes	yes	yes
within	0.0768	0.0186	0.0319	0.0107	0.0786	0.0185	0.0311	0.0108
between	0.3399	0.0034	0.1396	0.0342	0.2956	0.0014	0.1667	0.0317
overall	0.3564	0.0038	0.1555	0.0229	0.3154	0.0016	0.1729	0.021
N	1024	2296	1738	17442	1024	2296	1738	17442
Hausman Test	chi2=788.23 Prob > chi2 = 0.0000				chi2=788.96 Prob > chi2 = 0.0000			

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance.

NT: Non-traded, PM: Purely Importable, PX: Purely Exportable, MX: Mixed Sector.

Using tariff rate as a trade proxy, the results are on the whole the same as those obtained using effective protection rate. In terms of magnitude, the coefficients on *lnepr* are higher than the coefficients on *lntar*. Note that the tariff rates applied above are only for the firm's final output while effective protection rates take into account the

tariff rates on both inputs and outputs of the firm.

5.3. Policy Reversal

Amidst an incomplete trade liberalization process, the government adopted a policy of selective protection in 2003. Two pieces of legislation were passed which increased the tariffs on goods that were domestically produced, and reduced those on goods that were not locally manufactured. To examine the impact of the reversal, Equation 4 is estimated by dividing the years into two periods to roughly cover the years before and after the policy reversal. Tables 16 and 17 show the fixed effects results (Appendix 3 contains the results using OLS and random effects methods).

Table 16. Period 1996-2002 Fixed Effects Results

	(1)EPR as trade proxy				(2)Tariff rate as trade proxy			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	0.083	-0.044*	0.04	-0.007	0.011	-0.005	-0.016	0.007
	(0.066)	(0.031)	(0.050)	(0.014)	(0.020)	(0.011)	(0.022)	(0.004)
exit indicator	-0.009	0.015*	0.006	-0.002	-0.009	0.015**	0.006	-0.002
	(0.008)	(0.007)	(0.008)	(0.002)	(0.008)	(0.007)	(0.008)	(0.002)
lnworkers	0.016*	-0.003	-0.012	0.008**	0.016*	-0.002	-0.013	0.008**
	(0.012)	(0.010)	(0.012)	(0.004)	(0.012)	(0.010)	(0.012)	(0.004)
sector indicators	no	yes	no	yes	no	yes	no	yes
year indicators	yes	yes	yes	yes	yes	yes	yes	yes
within	0.046	0.037	0.04	0.011	0.041	0.034	0.039	0.012
between	0.261	0.007	0.195	0.047	0.27	0.006	0.22	0.033
overall	0.26	0.008	0.145	0.046	0.281	0.006	0.17	0.034
N	519	1364	912	9660	519	1364	912	9660
Hausman Test	chi2=271.91 Prob > chi2 = 0.0000				chi2=334.18 Prob > chi2 = 0.0000			

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance.

Table 17. Period 2003-2006 Fixed Effects Results

	(1)EPR as trade proxy				(2)Tariff rate as trade proxy			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	0.025	0.152	0.092	-0.007	0.021	0.01	-0.004	0.008
	(0.866)	(0.145)	(0.262)	(0.053)	(0.056)	(0.017)	(0.035)	(0.007)
exit indicator	0.003	-0.028	-0.004	-0.0001	0.003	-0.028	-0.004	0.00001
	(0.020)	(0.021)	(0.016)	(0.004)	(0.021)	(0.022)	(0.016)	(0.004)
lnworkers	0.029	-0.020*	-0.024***	-0.010***	0.029	-0.020**	-0.025***	-0.010***
	(0.016)	(0.013)	(0.009)	(0.004)	(0.015)	(0.013)	(0.009)	(0.004)
sector indicators	yes	no	no		yes	no	no	yes
year indicators	yes	yes	yes		yes	yes	yes	yes
within	0.047	0.02	0.025	0.01	0.047	0.018	0.025	0.01
between	0.357	0.209	0.274	0.074	0.313	0.261	0.269	0.088
overall	0.344	0.188	0.234	0.083	0.301	0.25	0.237	0.095
N	505	932	826	7782	505	932	826	7782
Hausman Test	chi2=401.13 Prob > chi2 = 0.0000				chi2=422.08 Prob > chi2 = 0.0000			

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance.
NT: Non-traded, PM: Purely Importable, PX: Purely Exportable, MX: Mixed Sector.

Prior to the policy reversal, the coefficient on *lnepr* is negative and significant at 10% level for the purely importable sector. For the mixed sector, the coefficient on *lnepr* is also negative but not statistically significant. Its coefficient on *lnworkers* is positive and highly significant. After the announcement of the selective protection policy, the coefficient on *lnepr* for the purely importable sector turned positive, but insignificant. For the mixed sector, the coefficient on *lnepr* is still negative and insignificant. The purely importable sector registered positive aggregate productivity growth rates in 1997 and 1998. The sector grew by 2.2% from 1996 to 1998, most of which was due to within productivity growth. For the whole period, the sector's productivity declined by about 1% from 1996 to 2006. For the mixed sector, aggregate productivity declined by around 4% between 1996 and 2006.

It is possible that with the selective protection policy, the early productivity improvements arising from the mid-1990's liberalization were not sustained due to the increase in protection in the early 2000s. As Table 12 shows, the aggregate productivity was positive immediately after 1996 till the late 1990s for food, beverages and tobacco,

which grew by 3% from 1996 to 1998.[6] Garments also grew by 2.5% during the same span of years along with wood and metallic products. Petroleum, chemicals and rubber grew by 2.9% from 1996 to 2000, while machinery equipment and transport also grew by 0.9% during the same period. Thereafter, aggregate productivity growth in these sectors turned negative.

With respect to the coefficient on *lnworkers*, this turned negative and highly significant, which might indicate that firms were downsizing to improve their efficiency. For the purely exportable and purely importable sectors, the coefficient on *lnworkers* is also negative and significant at the 1% level for the former and at 10% level for the latter. Meanwhile, the coefficient on *exit* remained insignificant before and after the policy reversal. Note however, that for the purely importable sector, the coefficient on exit was positive and significant at the 10% level during the period 1996-2002 indicating that exiting firms have higher productivity than continuing firms. This might signal an economic distortion in production and misallocation of resources due to the wide differences in protection. In the next period, however, this was no longer significant.

5.4. Summing Up

The results provide some evidence in support of the hypothesis that trade liberalization leads to productivity gains and protection leads to productivity losses. This is confirmed by the negative and significant coefficient on *lnepr* (see Table 15) for the purely importable sector. While the coefficient on *lnepr* is statistically insignificant for the mixed sector, its coefficient on the *exit* indicator is negative and significant at the 5% level. The fourth tariff reform program was designed to further modify tariffs towards a more uniform structure. However, it was never implemented in 2001 and instead, a selective protection policy was adopted. As such, the gains in terms of productivity improvement arising from trade reforms were not as large as expected. The selective protection policy reversed the gains from previous trade liberalization episodes and weakened the whole process of restructuring and reshuffling of resources from less productive to more productive firms as protection of selected industries

[6] The Asian Financial Crisis in 1997-1998 might have led to negative aggregate productivity growth in the early 2000s.

allowed inefficient firms to survive. Hence, from 1996 to 2006, the aggregate productivity growth of the purely importable and mixed sectors dropped by 1% and 3.9%, respectively while the aggregate productivity of the non-traded sector rose by 3.9%.

Based on the fixed effects results, the purely exportable sector's productivity seems to be unaffected by trade reforms. As Table 12 shows, the sector's aggregate productivity grew by 3.8% from 1996 to 2006, 5% of which was due to the reallocation of market shares towards more efficient firms. As discussed earlier, the protection system has continued to impose a penalty on exporters and to address this, the government has allowed exporters to import their raw materials and input tax and duty free through export processing zones and other schemes such as, tax credit, duty drawback and bonded manufacturing warehouse programs. However, not all exporters are able to avail of these schemes which are costly, particularly for small and medium-sized firms. This may possibly explain the lack of significant correlation between the productivity of exporters and trade reforms. Moreover, given the bias of the protection system towards importables and against exportables, the incentive to misallocate resources has remained, and prevented the movement of resources towards exportables.

6. Conclusions and Policy Implications

The more recent empirical literature on trade and productivity shows that in the presence of firm heterogeneity, trade liberalization allows more productive firms to expand while less efficient firms either exit or shrink. With the exit of inefficient firms, resources (labor and capital) will be freed and will move to other industries where they can be used more productively. Trade liberalization drives the process of restructuring and reshuffling of resources within and across sectors of the economy such that unprofitable activities contract while profitable ones expand. In general, more recent studies show that the productivity of firms exposed to international trade, i.e., exporters and import-competing firms, grows much more than that of firms in the non-traded sectors (Epifani 2003).

The results of the paper provide some evidence in support of the hypothesis that trade liberalization leads to productivity gains and conversely, protection leads to productivity losses. This is confirmed by the negative and significant coefficient on *lnepr* for the purely importable sector. For the mixed sector, the coefficient on *lnepr* is also negative but statistically insignificant. With respect to its coefficient on the *exit* indicator, it has the correct negative sign that is significant at the 5% level.

The fourth tariff reform program was designed to further modify tariffs towards a more uniform structure. However, it was never implemented and instead, the government adopted a selective protection policy. Simultaneously, the government resorted to alternative instruments of protection as seen in the growing application of contingent protection measures[7] such as safeguard measures and anti-dumping duties. Tariff Commission reports show that between 2000 and 2006, safeguard measures were granted in cement, ceramic tiles, chemicals, float glass, figured glass, and glass mirrors. As such, the gains in terms of productivity improvement arising from initial trade reforms dissipated. It also weakened the whole process of restructuring and reshuffling of resources from less productive to more productive firms, as the protection of selected industries allowed and prolonged the survival of inefficient firms.

Reversing the policy towards selective protection in midstream was costly in terms of the productivity losses in both the purely importable and mixed sectors. The productivity estimates show that right after the substantial trade reforms carried out till the mid-1990s, there were aggregate productivity gains observed in the purely importable sector as its growth increased by 2.2% from 1996 to 1998. Overall, its aggregate productivity growth declined by 1% from 1996 to 2006. For the mixed sector, aggregate productivity dropped by 3.9% during the same period.

In contrast, the purely exportable sector which was penalized by the protection structure and the non-traded sector were the ones that grew as their aggregate productivity increased by 3.8% and 3.9%, respectively from 1996 to 2006. For the purely exportable sector, 5% of its aggregate productivity growth was due to the reallocation of market shares towards more efficient firms. In the case of the non-traded sector, 3.2% was due to the reallocation effect and 0.8% due to within productivity

[7] These are not included in the calculation of effective protection rates.

growth.

The policy of selective protection has substantially reduced the credibility of trade reforms. Rodrik (1989) points out that the primary need for a government engaged in trade liberalization is to establish and bolster its credibility. Allowing the possibility of providing protection amidst the transition process sends a signal to firms that the government will not commit itself to a given policy reform. This can negatively affect the performance of firms and can lead to so-called time-inconsistency problems. The firms do not adjust because they expect to obtain further protection in the future. When the future comes, it may not be politically optimal for the government not to grant such protection.

The preceding analysis suggests a thorough review of the protection structure. The diverse tariff protection and bias against exports must be corrected to complete the liberalization process. Engaging in tariff reforms that do not reduce the level of dispersion of the tariff structure will convey relatively small benefits. Hence, the government needs to reduce the highest tariffs as there are costs involved in terms of inefficiencies in resource allocation. There is also a need to simplify the tariff structure by limiting the number of tariffs and reducing both tariff levels and their dispersion by adopting a more uniform tariff structure. A uniform tariff policy will address the current distortion in the protection system where intermediate inputs such as sugar, petrochemicals, glass, iron and steel have higher tariffs than their final user products.

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Appendix Tables

Appendix 1. Trade Orientation of Industry Sectors

Purely Importable
Rice and corn milling
Flour, cassava and other grains milling
Coffee roasting and processing
Soft drinks and carbonated water
Newspapers and periodicals
Manufacture of other non-metallic mineral products, n.e.c.
Manufacture of metal containers
Manufacture of ophthalmic goods
Manufacture of stationers', artists' and office supplies
Meat and meat products processing
Butter and cheese manufacturing
Other dairy products
Manufacture of refined coconut oil and vegetable oil
Manufacture of animal feeds
Manufacture of starch and starch products
Tanneries and leather finishing
Manufacture of agricultural machinery and equipment
Manufacture and assembly of motor vehicles
Purely Exportable
Tobacco leaf flue-curing and redrying
Manufacture of articles made of native materials
Commercial and job printing and other allied industries
Manufacture of wood carvings
Fish drying, smoking and manufacturing of other seafood products
Production of crude coconut oil, copra cake and meal
Manufacture of desiccated coconut
Hosiery, underwear and outerwear (knitted)
Manufacture and repair of rattan furniture including upholstery
Manufacture of jewelry and related articles

(Appendix 1. Continued)

Mixed
Manufacture of bakery products except noodles
Noodles manufacturing
Sugar milling and refining
Malt liquors and malt
Cigarette manufacturing
Cigar, chewing and smoking tobacco
Manufacture of carpets and rugs
Cordage, rope, twine and net manufacturing
Embroidery establishments
Manufacture and repair of other furnitures and fixtures, n.e.c.
Manufacture of paper and paperboard containers
Manufacture of soap and detergents
Manufacture of perfumes, cosmetics and other toilet preparations
Manufacture of asphalt, lubricants and miscellaneous products of petroleum and coal
Cement manufacture
Manufacture of structural concrete products
Manufacture of communication and detection equipment
Manufacture of appliances and house wares
Manufacture of primary cells and batteries and electric accumulators
Rebuilding and major alteration of motor vehicles
Milk processing
Fish canning
Other crude vegetable oil, fish and other marine oils and fats (except coconut oil)
Manufacture of cocoa, chocolate and sugar confectionery products
Miscellaneous food products
Alcoholic liquors and wine
Textile, spinning, weaving, texturizing and finishing
Fabric knitting mills
Manufacture of artificial leather and impregnated and coated fabrics
Manufacture of leather footwear and footwear parts
Sawmills and planning of wood
Manufacture of veneer and plywood
Manufacture of wooden and cane containers and small cane wares
Manufacture of pulp, paper and paperboard
Manufacture of articles of paper and paperboard
Printing and publishing of books and pamphlets
Rubber tire and tube manufacturing
Manufacture of other rubber products, n.e.c.
Manufacture of basic industrial chemicals

(Appendix 1. Continued)

Mixed
Manufacture of fertilizers
Manufacture of synthetic resins, plastic materials and other man-made fiber except glass
Manufacture of pesticides, insecticides, etc.
Manufacture of paints, varnishes and lacquers
Manufacture of drugs and medicines
Manufacture of miscellaneous chemical products
Manufacture of plastic furniture, plastic footwear and other fabricated plastic products
Petroleum refineries including LPG
Manufacture of flat glass
Manufacture of glass container
Manufacture of other glass and glass products
Manufacture of structural clay products
Blast furnace and steel making furnace, steel works and rolling mills
Iron and steel foundries
Non-ferrous foundries
Cutlery, hand tools, general hardware
Structural metal products
Manufacture of wire nails
Manufacture of non-electric lighting and heating fixtures
Manufacture of metal and wood-working machinery
Engines and turbines, except for transport equipment and special industrial machinery and equipment
Manufacture of pumps, compressors, blowers and air conditioners
Machine shops and manufacture of non-electrical machinery and equipment, n.e.c.
Radio and TV receiving sets, sound recording and reproducing equipment including records and tapes
Manufacture of motor vehicles parts and accessories
Manufacture, assembly of motorcycles and bicycles
Assembly, rebuilding & major alteration of railroad equipment, aircraft, & animal& hand-drawn vehicle
Manufacture of professional, scientific measuring and controlling equipment
Manufacture of photographic and optical instruments
Manufacture of musical instruments
Manufacture of surgical, dental, medical and orthopedic supplies
Manufacture of toys and dolls except rubber and plastic toys
Canning and preserving of fruits and vegetables
Manufacture of flavoring extracts, mayonnaise and food coloring products
Manufacture of made-up textile goods except wearing apparel
Manufacture of ready-made clothing
Manufacture of other wearing apparel except footwear
Millwork plants
Manufacture of misc wood, cork and cane products

(Appendix 1. Continued)

Mixed
Manufacture and repair of wooden furniture including upholstery
Manufacture of products of leather and leather substitutes except footwear and wearing apparel
Manufacture of rubber footwear
Manufacture of pottery, china and earthen wares
Non-ferrous smelting and refining plants, rolling, drawing and extrusion mills
Manufacture, assembly and repair of office, computing and accounting machines
Manufacture of electrical, industrial machinery and apparatus
Manufacture of parts and supplies for radio, TV and communication
Manufacture of semi- conductor devices
Insulated wires and cables
Manufacture of current-carrying wiring devices, conduits and fittings
Shipyards and boatyards
Manufacture of watches and clocks
Manufacture and repair of furniture and fixtures, made primarily of metal
Manufacture of sporting and athletic goods
Miscellaneous manufacturing
Non-traded
Slaughtering and meat packing
Ice cream, sherbets and other flavored ices
Manufacture of ice, except dry ice
Bottling of Mineral Water
Manufacture of fiber batting, padding, upholstery fillings including coir, linoleum and other hard surfaced floor coverings
Custom tailoring and dressmaking shops
Manufacture of hardboard and particle board
Wood drying and preserving plants
Metal stamping, coating, engraving mills
Manufacture of other fabricated wire and cable products except insulated wire and cable
Manufacture of fabricated metal products except machinery and equipment
Manufacture of electrical lamps, fluorescent tubes and other electrical apparatus and supplies, n.e.c.

Appendix 2. Number of Firms in the Panel

Year	Number of firms per year	Number of firms that exited by 2006
1996	2603	5
1997	2642	826
1998	2627	204
2000	2135	471
2002	2448	857
2003	2207	610
2005	3508	593
2006	4330	--
Total	22500	3566

Appendix 3. Regression Results

Table 3.1. OLS Results: Period 1996-2002

	(1)EPR as trade proxy				(2)Tariff rate as trade proxy			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	-0.129***	-0.060***	0.119***	-0.050***	-0.027***	-0.019***	0.056***	-0.033***
	(0.033)	(0.016)	(0.032)	(0.010)	(0.012)	(0.004)	(0.021)	(0.003)
exit indicator	-0.001	0.006	-0.001	-0.010***	-0.001	0.007	-0.002	-0.010***
	(0.009)	(0.008)	(0.008)	(0.003)	(0.010)	(0.008)	(0.009)	(0.003)
lnworkers	0.048***	0.064***	0.039***	0.043***	0.048***	0.064***	0.040***	0.043***
	(0.003)	(0.002)	(0.003)	(0.001)	(0.003)	(0.002)	(0.003)	(0.001)
sector indicators	yes	yes	yes	yes	yes	yes	yes	yes
year indicators	yes	yes	yes	yes	yes	yes	yes	yes
firm indicators	no	no	no		no	no	no	no
R-squared	0.448	0.424	0.28	0.279	0.442	0.426	0.276	0.292
N	519	1364	912	9660	519	1364	912	9660

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance.

Table 3.2. Random Effects Results: Period 1996-2002

	(1)EPR as trade proxy				(2)Tariff rate as trade proxy			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	-0.028	-0.065***	0.065**	-0.032***	-0.009	-0.019***	-0.005	-0.020***
	(0.038)	(0.018)	(0.032)	(0.009)	(0.012)	(0.006)	(0.018)	(0.003)
exit indicator	-0.005	0.011*	0.004	-0.005***	-0.005	0.012**	0.004	-0.005***
	(0.007)	(0.006)	(0.007)	(0.002)	(0.007)	(0.006)	(0.007)	(0.002)
lnworkers	0.041***	0.054***	0.035***	0.038***	0.042***	0.054***	0.034***	0.038***
	(0.004)	(0.004)	(0.004)	(0.001)	(0.004)	(0.004)	(0.004)	(0.001)
sector indicators	yes	yes	yes	yes	yes	yes	yes	yes
year indicators	yes	yes	yes	yes	yes	yes	yes	yes
within	0.029	0.004	0.007	0.005	0.029	0.004	0.006	0.004
between	0.439	0.444	0.295	0.31	0.438	0.442	0.289	0.325
overall	0.436	0.42	0.278	0.274	0.434	0.422	0.268	0.286
N	519	1364	912	9660	519	1364	912	9660
Breusch-Pagan Test	chi2(1) = 4551.05 Prob > chi2 = 0.0000				chi2(1) = 4373.08 Prob > chi2 = 0.0000			

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance.

Table 3.3. OLS Results: Period 2003-2006

	(1)EPR as trade proxy				(2)Tariff rate as trade proxy			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	-0.11	-0.127***	-0.024	-0.072***	-0.059***	-0.031***	-0.040*	-0.036***
	(0.084)	(0.031)	(0.113)	(0.017)	(0.026)	(0.005)	(0.022)	(0.003)
exit indicator	0.011	-0.004	0.0005	-0.011***	0.01	-0.002	0.002	-0.010***
	(0.013)	(0.015)	(0.009)	(0.003)	(0.013)	(0.015)	(0.009)	(0.003)
lnworkers	0.055***	0.064***	0.044***	0.044***	0.055***	0.065***	0.044***	0.043***
	(0.004)	(0.003)	(0.003)	(0.001)	(0.004)	(0.003)	(0.003)	(0.001)
sector indicators	yes	yes	yes	yes	yes	yes	yes	yes
year indicators	yes	yes	yes	yes	yes	yes	yes	yes
firm indicators	no	no	no		no	no	no	no
R-squared	0.3826	0.3235	0.254	0.3016	0.3871	0.3359	0.2572	0.3162
N	505	932	826	7782	505	932	826	7782

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance

Table 3.4. Random Effects Results: Period 2003-2006

	(1)EPR as trade proxy				(2)Tariff rate as trade proxy			
Explanatory Variable	NT	PM	PX	MX	NT	PM	PX	MX
trade proxy	-0.064	-0.118***	-0.043	-0.060***	-0.039	-0.029***	-0.023	-0.031***
	(0.092)	(0.036)	(0.129)	(0.019)	(0.028)	(0.006)	(0.021)	(0.003)
exit indicator	0.007	0.001	-0.001	-0.006*	0.006	0.001	-0.0001	-0.006*
	(0.012)	(0.013)	(0.009)	(0.003)	(0.012)	(0.013)	(0.009)	(0.003)
lnworkers	0.052***	0.053***	0.039***	0.040***	0.052***	0.053***	0.039***	0.040***
	(0.004)	(0.004)	(0.004)	(0.001)	(0.004)	(0.004)	(0.004)	(0.001)
sector indicators	yes	yes	yes	yes	yes	yes	yes	yes
year indicators	yes	yes	yes	yes	yes	yes	yes	yes
within	0.043	0.006	0.016	0.003	0.042	0.006	0.015	0.003
between	0.408	0.349	0.294	0.347	0.411	0.36	0.298	0.364
overall	0.381	0.32	0.253	0.3	0.385	0.333	0.256	0.315
N	505	932	826	7782	505	932	826	7782
Breusch-Pagan Test	chi2(1) = 1782.12 Prob > chi2 = 0.0000				chi2(1) = 1728.07 Prob > chi2 = 0.0000			

Note: Robust standard errors in parentheses. * 10% level, **5% level of significance, ***1% level of significance.