Outward FDI and Productivity: Micro-evidence from Slovenia[1]

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Abstract

This paper tests three empirical hypotheses that relate the decision for outward FDI to total factor productivity. For this purpose, we use a rich data set of Slovenian manufacturing firms active in the period 1994-2002 that contains information on outward FDI and exports to different markets. The evidence supports the hypothesis proposed by Helpman, Melitz and Yeaple (2004) that more productive firms are more likely to invest in a foreign affiliate. The data also support a positive relationship between the number of foreign affiliates and total factor productivity. However, the hypothesis proposed by Head and Reis (2003) that less productive firms may be encouraged to invest in low-income countries is rejected by the data. The evidence also supports the hypothesis that required productivity increases with number of markets that firm serves. Finally, this paper finds that past exporting experience to individual countries increases the likelihood of investment to respective markets.

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1 INTRODUCTION

This paper is based on the recent theoretical work (Montagna, 2001; Melitz, 2003) and empirical evidence (Clerides, Lach and Tybout, 1998; Pavcnik, 2002; Tybout, 2003) which introduces heterogeneity of firms' characteristics into standard monopolistic competition models. We build on recent empirical papers by Helpman, Melitz and Yeaple (HMY, 2004), Head and Ries (HR, 2003), and Kostevc (2005) who show that total factor productivity of firms may explain which firms within industries - given equal trade and investment opportunities within sectors - serve only domestic markets and which firms serve domestic and foreign markets through different channels.

The aim of the paper is to examine two recent predictions of the literature on firm's exports vs. FDI decision. First, we examine the prediction by HMY which states that only the most productive firms tend to serve foreign markets via foreign affiliates, while firms with intermediate productivity export. Next, we test the HR prediction that a range of foreign markets served by individual firm depends on its productivity level. In addition, we also test whether there is a relationship between productivity levels of firms and the number of foreign markets firms serve. This paper contributes to the literature by introducing additional dimension to firm's exports vs. FDI decision, that is, the heterogeneity of foreign markets. Firms make a decision to serve these markets either via exports or foreign affiliates also according to specific characteristics of the target markets, such as distance, differences in relative factor costs as well as specific market conditions (instability, uncertainty of payments).

In order to test the relevance of these two predictions, we use a unique firm-level data set for Slovenian manufacturing that contains information on trade and investment flows to individual foreign markets. We gain several important insights. First, in line with HMY we find roughly 20 percent average productivity advantage of exporting firms and firms with

outward FDI over firms that serve only domestic markets. However, in contrast to the evidence provided in HMY, there is no statistically significant productivity advantage of firms with foreign affiliates over exporting firms. Nevertheless, our evidence suggests that this discrepancy is transitory and mainly due to transition specific features related to inherited foreign investments of large inefficient firms. This is confirmed by the finding that the probability that a firm invests in the first-ever foreign affiliate increases with total factor productivity. Second, we find some support that firms that invest only to low-income countries have lower average productivity. However, the marginal effect of increased productivity on probability to invest in poor and rich countries is not statistically significant, which rejects the hypothesis of HR. Third, using recently proposed estimation method for dynamic count data with persistent unobservable firm heterogeneity by Blundell et al. (2003), we estimate the model for the number of foreign affiliates and find that more productive firms are also more likely to have more foreign affiliates. Moreover, investments in foreign affiliates are highly persistent with probability of exit from foreign markets around 22 percent. Fourth, in addition to total factor productivity, we find that larger firms and firms with higher capital intensity are more likely to invest. Moreover, firms are more likely to invest in countries with higher past exporting experience, proxied by export share. Although our data are rich with information on direction of investments by individual firms, there is no information available on activities of foreign affiliates, such as sales, which prevents us from uncovering the motives for outward FDI of Slovenian manufacturing firms.

The remainder of the paper is organized as follows. First, we shortly review related empirical literature. In the third section, we describe basic features of the data for Slovenian manufacturing firms and some relevant background statistics for Slovenian foreign trade and FDI. In the fourth section we explore firm-level decisions to invest in one or more foreign affiliates, while the final section concludes.

2 RELATED EMPIRICAL STUDIES

While an extensive survey of related empirical studies is beyond the scope of this paper, we shortly empirical studies that relate firm productivity to decision for horizontal FDI.[3] HMY develop a simple multi-country model with multiple sectors of monopolistically competitive firms that may serve domestic and foreign markets through either exports or horizontal FDI. The novelty of their model is assumed heterogeneity of firms in terms of total factor productivity, which is reflected in marginal costs, prices and profits. The key results of the model are driven by interaction of this assumption, heterogeneity of fixed costs of supplying different markets through different channels and differences in trade costs. In particular, the least productive firms find it profitable to supply only domestic market; firms with intermediate productivity supply both domestic and foreign markets through exports and the most productive firms supply domestic market and foreign markets through foreign affiliate. HMY also provide evidence based on a cross-section of U.S. manufacturing firms active in 1996 that supports this pattern. They regress log of labor productivity (value added per worker) on industry dummies (ISIC 4-digit level), log of capital per worker (book value of capital), its square, and dummy variables for exporting firms and firms with foreign affiliates. Their results confirm theoretical prediction on productivity rankings of different groups of firms and find productivity advantage of exporting firm around 39 percent, while an average firm with outward FDI has 15 percent productivity advantage over an average exporting firm.

HR generalize the results of HMY by introducing also heterogeneity of factor costs, primarily labor, in different countries. An important case that works against HMY is when dealing with low-income countries. Namely, according to the HR model, we can expect that also low productivity firms may engage in FDI in low-cost foreign countries causing that average productivity level of firms with FDI in low-cost countries is lower than that of firms with FDI

[3] An interested reader is referred to a recent survey on firm heterogeneity, exporting and FDI by Greenaway and Kneller (2005).

to high-cost countries. In extreme case where foreign country is small and offers some cost advantage, the least productive firms invest in foreign affiliates whereas more productive produce at home and supply foreign markets through exports. HR also provide tests of model's main hypotheses on a sample of 1070 large publicly listed Japanese firms surveyed in 1989 and find that when host country offers no cost advantage firms with outward FDI are more productive than exporters. They also find that median and third quartile host country incomes tend to rise in step with investing firm's productivity, i.e. low productivity firms are most attracted to relocate production to low-cost foreign country and vice versa. However, Greenaway and Kneller (2005) note that the result of HR is an exception to the general pattern, possibly due to biased sample consisting of only large listed companies.

Another recent contribution to the field is an empirical study by Eaton, Kortum and Kramarz (EKK, 2004). For a sample of French manufacturing firms, authors show a monotonic negative frequency distribution for the number of exporting markets. It is straightforward to show in HMY model that heterogeneity of markets in terms of fixed costs of serving foreign markets and competitive pressure implies a positive relationship between the number of markets that firms serve either through exports or foreign affiliates and total factor productivity.

In this paper, we test three main hypotheses stemming from these contributions that relate productivity to decision for outward FDI. First, we test the prediction of HMY model which states that only the most productive firms can afford to serve foreign markets through foreign affiliates. Second, we test whether required productivity of firms to invest in low and high-income countries differs. Third, we test whether required productivity increases with number of markets that firm serves. We explore these hypotheses using a unique panel of all Slovenian manufacturing firms for which we have both balance sheet data and information on foreign activities. We believe this paper contributes to existing literature for several reasons.

First, the majority of studies focus on foreign investment decisions of firms that are based in developed countries, while this paper exploits the data for a set of firms from intermediate-income level country. Second, the data on investments of Slovenian manufacturing firms have sufficient variation both in terms of size of firms and foreign markets, which include both small and large and low and high-income countries. Lastly, the panel structure of our data allows us to deal with unobserved heterogeneity of firms in terms of productivity and pertaining issue of endogeneity.

3 DATA

a. Aggregate features of Slovene exports and outward FDI

Slovenia is a small open economy with strong international trading relations which is reflected in shares of exports and imports in GDP around 60 percent. The main trading partners for Slovenian firms are in developed countries, particularly those in the European Union. Namely, in Table 1 we can see that the share of exports and imports to EU countries were 68 and 77 percent of respective totals in 2001. Foreign trade with these markets, especially Germany, Austria and Italy, flourished during the period 1992-2001 as both exports and imports almost doubled. However, after 1999, the end of military conflicts on the ground of former Yugoslavia, rapid growth in foreign trade with developing countries becomes the driving force of total foreign trade growth. Hence regional structure of foreign trade changed in favor of developing countries.

Table 1: Structure and dynamics of Slovene foreign trade, 1992-2001 [in percent]

	Exports					Imports				
	92	99	01	$g_{99/92}$	$g_{01/99}$	92	99	01	$g_{99/92}$	$g_{01/99}$
Total	100	100	100	6.2	4.0	100	100	100	9.5	1.0
Developed	66	72	68	8.5	1.3	66	78	77	12.8	0.3
EU-15	61	66	62	9.0	1.0	60	69	68	13.2	0.2

Germany	21	31	26	12.1	-3.8	18	20	19	11.2	-1.4
Italy	13	14	12	7.0	-0.8	13	17	18	13.7	3.5
Austria	5	7	7	12.0	5.5	9	8	8	8.6	2.7
France	11	6	7	-2.7	13.1	9	11	11	12.7	-0.6
EFTA-4	2	1	1	1.1	3.5	3	2	2	4.6	-14.8
Other	5	5	5	4.8	4.9	6	7	8	12.5	5.2
Developing	34	28	32	1.6	11.0	34	22	23	1.8	3.3
CEFTA-6	4	7	8	17.4	9.1	5	9	10	18.1	7.0
Former Yu	23	15	17	-1.4	9.9	20	6	5	-9.4	-2.8
Croatia	14	8	9	-4.0	9.1	14	5	4	-7.7	-4.6
Other	8	6	7	-0.7	19.2	9	8	8	5.6	3.5

Source: Damijan and Majcen (2003).

Notes: *g* denotes average nominal growth rate calculated in euros.

Foreign trade flows and flows of foreign direct investment were closely related. In Table 2 we illustrate the dynamics of outward foreign direct investment over the period 1994-2002. From 1994, when total stock of outward FDI was only €289 million it increased almost five-fold, reaching €1.4 billion (or 7 percent of GDP) in 2002. In the total value of Slovenian outward FDI, 63 percent of which were ownership shares and the rest were net claims to foreign subsidiaries. Particularly strong growth of investment activity is characteristic for the period from 1999 to 2002 when almost half of total stock in 2002 was invested. Nevertheless, in spite of its accelerated growth in recent years, total stock of outward FDI is still relatively small when compared to inward FDI reaching about €4 billion (27 percent of GDP) in 2002. Given our focus on foreign investment decision of manufacturing firms, it is important to note that in 1994 only 35 percent of total stock was generated by these firms, although it gradually increased to 42 percent by 2002.

Table 2: Outward FDI of Slovene firms, 1994-2002 [mil. €]

	1994	1995	1996	1997	1998	1999	2000	2001	2002
OFDI	289	382	370	416	543	625	825	1139	1417
ΔOFDI	-	94	-12	46	127	82	201	314	278
G_{OFDI} [%]	-	32	-3	12	30	15	32	38	24

Source: Bank of Slovenia, Foreign Direct Investment Report, 2003.

Notes: Values correspond to end-of-year stocks.

b. Description of the data

In our empirical investigation of firm decision to engage in foreign investment, we use a panel of Slovenian manufacturing firms (NACE-2 digit sectors 15-37) that were operating during the period 1994-2002. The data set combines information on firm activities from financial statements, such as sales, employment, fixed tangible assets, labor and material costs, with information on firm exports, imports and foreign direct investments to specific markets. This structure of the data allows us to infer exact timing of new investment decisions, which allows us to test predictions by HMY and HR in a manner that does not raise the issue of endogeneity. Thus far, researchers used cross-section data and could only compare the productivity of firms with and without foreign direct investment, while the direction of causality could run in either way.

Our data set consists of 8,774 firms, although we use information for 7,021 firms that were active in at least one period. Our definition of an active firm consists of three conditions. A firm has to (i) employ at least one worker, (ii) engage a positive amount of physical capital and (iii) produce positive value added. This definition ensures that we can calculate labor productivity and capital intensity of firms in the sample. During the period of available data, which is the period of transition shortly after the start of economic reforms, Slovenian manufacturing underwent substantial shifts in industrial structure which is reflected in net entry of firms, decrease in average size and productivity growth (see e.g. Polanec, 2006). This pattern is also visible in Table 3, where we show that the number of firms in the sample increased from 3,388 in 1994 to 5,076 in 2002. Simultaneously, the process of increasing foreign activity is observed. The total number of exporters increased from 1,692 (50 percent of all active firms) in 1994 to 2,433 (48 percent) in 2002, while the total number of firms with outward FDI increased from 144 (4.2 percent) in 1994 to 262 (5.2 percent) in 2002. The

comparison of the third and fourth column reveals an important feature that only a small fraction of firms with outward FDI were not exporters.

Table 3: Firm dynamics in Slovenian manufacturing, 1994-2002

Year	*Number of firms* All active firms	Only exporters	Outward FDI	Exporters or outward FDI
1994	3,388	1,692	144	1,695
1995	3,874	1,889	148	1,891
1996	4,188	1,959	164	1,966
1997	4,425	2,036	165	2,042
1998	4,636	2,177	195	2,185
1999	4,744	2,229	198	2,238
2000	4,846	2,308	221	2,323
2001	4,794	2,347	256	2,364
2002	5,076	2,433	262	2,448

Source: Bank of Slovenia and own calculations.

Notes: Firms classified as exporters (outward FDI) export (invest) to at least one foreign market.

One of the hypotheses that we test below exploits the information on the number of foreign markets to which firms invest. Hence we review key features in this direction. Slovenian manufacturing firms invest in 51 different markets in all continents. However, a single firm invests in no more than 18 markets. Table 4 provides the distribution of the number of foreign markets to which Slovenian firms export and/or invest in 1994 and 2002. These distributions confirm a negative relationship between the number of foreign markets which domestic firms serve and the total number of firms engaged in these markets found by EKK for French manufacturing firms. Furthermore, the data also show that the number of markets that firms serve increased over time.

Table 4: Distribution of foreign activities of Slovenian manufacturing firms, 1994 and 2002

Number of foreign markets	*Exporting firms*		*Firms with outward FDI*	
	1994	2002	1994	2002
0	1,696	2,643	3,244	4,814
1	557	710	81	158
2	286	389	25	44
3	151	252	15	19
4	102	182	6	14
5	72	144	11	5
6-10	214	343	5	18
11-20	197	232	1	4
20-	113	182	0	0

Source: Bank of Slovenia and own calculations.

Note: The table shows absolute numbers of firms that export and invest in foreign affiliates.

Since firms with outward FDI in different countries have distinct characteristics, we also show the absolute numbers of outward FDI in different regions for our sample of firms. Unfortunately the data do not allow us to distinguish between different affiliates in individual countries. Hence in Table 5, where we show the regional distribution of outward FDI, we count outward FDI assuming that firm has only one affiliate in each country. The data show that over the entire period of available data, Slovenian firms mostly target neighboring countries founded on the ground of former Yugoslavia[4] and the European Union. In 1994 Slovenian firms had 157 direct investments in ex-Yugoslav markets; more than 50 percent share in total number of investments. While the number of outward FDI had been increasing in all regions throughout the sample period, the concentration of investments further increased as the share in the number of investments in the countries of former Yugoslavia grew to

[4] The largest share among countries of former Yugoslavia assumes Croatia, followed by Bosnia and Herzegovina, while among countries in the EU dominate investments to Austria, Italy and Germany.

almost 58 percent by 2002.[5] Moreover, we had witnessed faster growth of outward FDI also to other less developed countries such as new EU member states and ex-Soviet Union.

Table 5: Regional distribution of outward FDI by Slovenian manufacturing firms, 1994-2002 [in percent]

Country group	*1994*	*1997*	*2000*	*2002*
EU-15 (old member countries)	32.7	25.9	21.5	18.8
Ex - Yugoslavia (4 countries)	51.8	53.3	54.7	57.8
EU-9 (new member countries)	5.3	9.5	10.6	10.1
Ex - Soviet Union	2.3	4.2	6.3	5.4
OECD without Europe	4.3	4.7	5.0	5.0
Other	3.6	2.4	1.9	3.0
Total number	303	336	479	576

Source: Bank of Slovenia and own calculations.

Notes: The table contains the total number of investments in each region.

4 Econometric analysis

In this section we investigate the determinants of decisions to invest in foreign affiliates by Slovenian manufacturing firms. Again, our particular focus is on testing three predictions from the literature on firm's exports vs. FDI decision. First, HMY predict that only the most productive firms tend to serve foreign markets via foreign affiliates. Second, HR predict that a range of foreign markets served by individual firm depends on its productivity level. Three, an extension to HMY model predicts that firms that invest in more markets have higher productivity. Since other firm characteristics may also be relevant for foreign investments, we also include other explanatory variables such as capital intensity and size of firms.

[5] The share of total value of investments to different regions corresponds closely to the share of individual investments. For example, in 2002 about 59 percent of total stock of outward FDI was directed to countries of former Yugoslavia.

a. Descriptive statistics on firm characteristics and foreign activities

HMY model yields a clear-cut prediction. Everything else equal, only the most productive firms decide to invest in foreign affiliates, firms with intermediate productivity serve foreign markets through exports and the least productive firms serve only domestic market. While HMY confirmed this prediction for US firms, it is less obvious that this should be the case also for other countries. After losing their historically "domestic" markets of ex-Yugoslavia in 1991 due to trade embargo imposed by Serbia and Monte Negro, many large manufacturing firms in Slovenia experienced a huge output decline that was also reflected in reduction of labour productivity (Damijan, 2001). Hence, until 2004, medium and large firms were in fact less productive than micro and small firms (see Polanec, 2006). As many of these large firms had also outward FDI, the relationship between productivity and possession of foreign affiliates may not be in line with HMY due to these transition specific features. Our data reveal that censoring the sample of firms to only those with more than 100 employees would yield conclusion that exporting firms are less productive than firms serving only domestic market until 1999. However, when we consider all active manufacturing firms, we observe productivity advantage of exporting firms over non-exporting firms.

The evolution of basic characteristics of firms with and without outward FDI is summarized in Table 6. There we show unweighted averages of labor productivity (y), capital intensity (k) and size of firms (l) measured in terms of employment for the sample period. It is important to keep in mind that firms without outward FDI combine both non-exporting firms and exporting firms, while 95 exporters have also outward FDI. The data show that firms with outward FDI have on average higher labor productivity, engage more capital per employee and are on average larger. The statistical significance of these differences is also confirmed by t-tests of differences of means. Moreover, inter-temporal comparison suggests that relative differences in average labor productivity and capital intensity were increasing over time.

Table 6: Firm characteristics and foreign activity, 1994-2002

	Firms without outward FDI			Firms with outward FDI		
Year	*y*	*k*	*l*	*y*	*k*	*l*
1994	13.8	22.2	41	16.2	56.0	601
1995	15.2	25.6	36	18.1	54.7	605
1996	16.0	26.1	33	18.7	50.1	524
1997	17.7	27.3	29	21.7	62.9	521
1998	18.2	28.5	28	21.4	76.5	438
1999	19.6	28.3	28	25.1	85.8	417
2000	19.5	31.4	26	23.7	65.9	389
2001	20.3	32.9	26	26.0	69.4	348
2002	21.0	36.2	25	26.1	69.9	347

Source: Own calculations based on the data of Bank of Slovenia.

Notes: The values of value added per employee (*y*) and capital intensity (*k*) are given in thousand euros (current prices). The size of firms (*l*) is measured in terms of number of employees calculated from reported working hours.

In the previous section, we showed high concentration of outward FDI. In 2002, almost 58 percent of all investments have targeted the former Yugoslav republics and 18 percent were in the EU countries. These two groups of countries, however, exhibit substantial differences in terms of GDP per capita and real wages. As noted above, HR model predicts that the average productivity of firms investing to less developed countries should be on average lower. Hence in Table 7 we compare labor productivity, capital intensity and size of firms with foreign affiliates in different regions. In particular, we shall distinguish firms that own affiliates only in countries with lower income and firms that own affiliates also in high income countries. Firms are grouped in the following way. In the first group are firms that invest in ex-Yugoslav markets, 9 new member states of EU, countries on the ground of ex-Soviet Union, but do not invest in EU-15 and remaining OECD countries. Firms are classified to the second group if they also invest in EU-15 or OECD countries. The data for 2002 suggest that firms with foreign affiliates only in low-income countries are indeed less productive, less capital

intensive and smaller than firms that have also investments in high-income countries. These rankings of firms according to labor productivity are in line with prediction of HR model. However, this pattern is valid only after 1998, while before that firms with outward FDI in high-income countries had even slightly lower productivity. Moreover, this result could be also driven by the fact that firms investing in low and high-income countries (the second group) invest also in greater number of markets.

Table 7: Firm characteristics and location of outward FDI, 2002

Group of firms	*y*	*k*	*l*	Number of firms
without OFDI	21.0	36.2	25	4814
with OFDI only in low-income countries	25.6	54.3	221	190
with OFDI in high-income countries	27.5	110.8	679	72

Source: Bank of Slovenia and own calculations.

Notes: The values of value added per employee (*y*) and capital intensity (*k*) are given in thousand euro (current prices). The size of firms (l) is measured in terms of number of employees calculated from reported working hours.

Let us now look at some preliminary evidence on the relationship between the number of foreign affiliates and firm characteristics. Given obvious heterogeneity of foreign markets in terms of competitive pressures, distance and fixed costs, we should expect that only the most productive firms find it profitable to establish foreign affiliates in countries with low mark-ups and high fixed costs. Hence, we should observe a positive relationship between the number of firms and productivity. We provide preliminary evidence on this relationship in Table 8, where we show labor productivity, capital intensity and size for four groups of firms. Firms with more than five foreign affiliates are indeed the most productive ones, although the relationship is not a monotone one as firms with two to five investments are on average slightly less productive than firms with only one investment. However, there is a monotone

relationship between capital intensity and size on one hand and number of foreign markets on the other.

Table 8: Firm characteristics and number of foreign affiliates, 2002

Number of foreign markets (n)	*y*	*k*	*l*	Number of firms
n = 0	21.0	36.2	25	4,814
n = 1	25.6	47.2	172	158
1 < n < 6	25.2	69.5	452	82
n > 5	33.5	233.8	1,209	22

Source: Bank of Slovenia and own calculations.

Notes: The average value added per employee and the average capital intensity are given in thousand euros (current prices).

b. Are more productive firms more likely to invest in foreign affiliates?

HMY showed that firms serving foreign markets through foreign affiliates are more productive than exporters and firms that serve only domestic markets. However, their estimates of productivity advantage are based on a cross-section of firms and thus do not allow one to infer what is the direction of causality between foreign investment decision and productivity. While it may be true that more productive firms invest in foreign affiliates, they can not rule out the possibility that firms with foreign affiliates enjoy productivity gains due to e.g. technological spillovers. The panel structure of our data allows us to resolve the issue of causality by using information on timing of investment. Nevertheless, in order to establish a benchmark comparison of our results with HMY, we start by replicating their test. Hence, we first regress log of labor productivity on dummies for exporters and firms with outward FDI controlling for log of capital intensity and 2-digit industry effects. As argued above, Slovenian manufacturing firms suffered from a large productivity shock caused by trade embargo in 1991, which may lead to time varying estimates of productivity advantage. Therefore, in Table 9, we summarize regression coefficients for dummy variables for

exporters and firms with outward FDI for three different periods. These results are in line with typical findings of productivity advantage of exporting firms over non-exporting firms. However, this productivity advantage ranges between 18.7 and 23.9 percent, which is much lower when compared to estimates by HMY who find 39 percent productivity advantage. Moreover, in contrast to findings by HMY who find 15 percent productivity advantage for US multinational firms, Slovenian multinational firms exhibit no statistically significant advantage. However, as we showed above, the majority of Slovenian multinationals made their investments before the start of transition. Since many firms lost important markets on the ground of ex-Yugoslavia their productivity declined, these results may be transition specific. In fact, we show below that the characteristics of firms that invested in foreign affiliates only recently are on average more productive.

Table 9: Productivity advantage of exporters and firms with outward FDI over firms serving domestic market only

	1994	1998	2002
Exporters	0.239	0.187	0.187
	(6.55)	(7.22)	(8.37)
Outward FDI	0.249	0.152	0.204
	(2.80)	(2.32)	(5.29)
Coefficient difference	0.010	-0.035	0.017
	(0.03)	(0.38)	(0.29)
Number of firms	3388	4636	5076

Source: Bank of Slovenia and own calculations.

Notes: *t* –statistics are in parentheses (calculated on the basis of White standard errors). *F*-statistics are used for the test of the difference between coefficients. Coefficients for capital intensity and size are suppressed.

(i) Firm-level analysis

The results on productivity advantage of non-multinational exporters and multinationals in Table 9 raise two concerns. First, cross-sectional data do not allow us to make statements on the direction of causality as multinational firms may be more productive due to productivity

gains from their international activities. Second, cross-sectional data do not distinguish between new and old investments in foreign affiliates.

The richness of panel data allows us to tackle both of these concerns. The first possibility is to focus only on firms without prior engagement in outward FDI. By limiting the sample to these firms and predetermined (lagged) firm characteristics as explanatory variables in modeling the decision to invest in a foreign affiliate, the direction of causality can run in only one direction. Moreover, this sample of firms focuses only on new investors that did not suffer from trade embargo. By focusing on the first decision to invest in outward FDI, we also avoid the econometric issues that arise in the context of lagged endogenous limited dependent variable and unobservable firm heterogeneity.

The decision to invest in the first foreign affiliate is modeled in the following way:

$$\Pr[OFDI_{it}=1]=\beta_0+\beta_1\ln y_{it-1}+\beta_2\ln k_{it-1}+\beta_3\ln l_{it-1}+\beta_4 D_{Ex,it-1} \sum_k \beta_{5k}D_k+\sum_j \beta_{6j}D_j+\varepsilon_{it}, \quad (3)$$

where $\Pr[OFDI_{it}=1]$ denotes the probability that firm *i* invests in one or more foreign affiliates in period *t*. On the right-hand side of equation (3), we have logs of labor productivity, capital intensity and employment. Since we include both labor productivity and capital intensity, the coefficient for labor productivity is interpreted as a measure of the marginal effect of total factor productivity. We also include time dummies to capture cyclical effects and 2-digit industry dummies to capture industry-specific effects. We assume that the error term is a standard normal random variable and thus use standard pooled probit estimator. Table 10 contains the estimates of equation (3). In the second column we show estimates for all manufacturing firms, while in the third column we estimates are based on a sample of exporters. The results are robust to specification used. We find that firms with higher total factor productivity are more likely to invest in outward FDI, which confirms the prediction of HMY model also for Slovenian firms. While the coefficient is statistically significant, its

economic significance is relatively modest. The marginal effect for a firm with average characteristics suggests that an increase in productivity by 100 increases probability of investment in a foreign affiliate only by 0.1 percentage point. The coefficient for capital intensity has expected positive sign, although it is not statistically significant. The results also suggest that size of firms is an important factor driving the decision for outward FDI. Finally, we can see in the second column that firms with higher exports shares are more likely to invest in foreign affiliates. This result suggests that prior investment in market by exporting is crucial for future investment.

Table 10: Probit model of decision of manufacturing firms for outward FDI, firm level analysis, 1995-2002

Model	(1)	(2)
Var \ Period	1995-2002	1995-2002
ln y_{t-1}	0.272 (4.56)***	0.300 (4.52)***
ln k_{t-1}	0.047 (1.67)	0.029 (0.94)
ln l_{t-1}	0.317 (14.77)***	0.319 (13.66)***
Exports dummy $_{t-1}$	0.294 (3.00)***	-
Industry dummies	Yes	Yes
Time dummies	Yes	Yes
Observations	31,479	14,788
Pseudo R^2 (χ^2-stat.)	0.227 (562.21)	0.160 (319.53)

Source: Bank of Slovenia and own calculations.

Notes: Dependent variable is a dummy variable $OFDI_{it}$ [1 if outward FDI takes place in period t and 0 if not]. z-statistics are given in parentheses. ***, **, and * indicate significance of coefficients at 1, 5, and 10 per cent, respectively.

(ii) Firm-market-level analysis

In this section, we exploit also the available information on markets in which firms invest. As described in the second section, HR model suggests that propensity to invest in a foreign affiliate depends on the features of foreign markets. In particular, their model predicts that

firms with lower productivity may have greater incentives to invest in countries with lower real wages. In order to test this prediction, we shall, in subsequent analysis, distinguish between affiliates in low and high-income countries. Again, we avoid the issue of reverse causality by focusing on first-ever investment in either set of countries or both. Clearly, the decisions to invest in foreign affiliates may be strongly related, which is suggested by descriptive statistics summarized in Tables 7 and 8. Hence we shall estimate a bivariate probit model with the following system of equations:

$$
\begin{aligned}
&\Pr\left[OFDI_{it}^{\ Low}=1\right]=\beta_0+\beta_1\ln y_{it-1}+\beta_2\ln k_{it-1}+\beta_3\ln l_{it-1}+\beta_4 ExSh_{it-1}\\
&\sum_k\beta_{5k}D_k+\sum_j\beta_{6j}D_j+\varepsilon_{it},\\
&\Pr\left[OFDI_{it}^{\ High}=1\right]=\gamma_0+\gamma_1\ln y_{it-1}+\gamma_2\ln k_{it-1}+\gamma_3\ln l_{it-1}+\gamma_4 ExSh_{it-1}\\
&\sum_k\gamma_{5k}D_k+\sum_j\gamma_{6j}D_j+\xi_{it}.
\end{aligned}
\tag{4}
$$

The dependent variables in the first and second equations are the probabilities that firm *i* invests in a foreign affiliate in period *t* in low and/or high income countries. The right-hand side variables are the same as in (3). An additional variable instead of exports dummy here is prior export share to a respective group of countries. The appropriate estimation method for this system is joint maximum likelihood as it allows for expected positive correlation of error terms ($corr(\varepsilon_{it},\xi_{it})>0$). The likelihood ratio test for zero correlation is rejected, which confirms appropriateness of this framework. The results, summarized in Table 11, show that the marginal effects of total factor productivity on probability of investment are very similar for low and high-income countries and thus reject the hypothesis of HR that less productive firms may have greater incentives to invest in low-income countries. Again, the coefficients for capital intensity are not statistically significantly different from zero, while size is again an important determinant of investments in both sets of target markets. Note also an important difference between coefficients for export shares for low and high-income countries. This

result should not, however, be given a great weight as a sum of export shares to group of very heterogeneous countries may not be a good determinant of investment activity in the same group of countries. Below we return to this issue using firm-market level estimates for past export shares. At last, constant is lower for high-income countries, which suggests that Slovenian manufacturing firms are more likely to invest in low-income countries. One possible explanation for this pattern is weaker competition, differential assessment of risk between Slovenian and other foreign firms in these markets or simply the historical preference of Slovenian firms to do business and invest in countries of former Yugoslavia.

Table 11: Bivarite probit model for decision to invest in foreign affiliates, firm-level analysis, 1994-2002

Var \ Equation	High-income	Low-income
ln y_{t-1}	*0.285 (2.20)	***0.300 (3.95)
ln k_{t-1}	0.043 (0.69)	-0.004 (-0.13)
ln l_{t-1}	***0.247 (5.37)	***0.330 (11.88)
$ExSh_{t-1}$	0.023 (0.13)	***0.369 (3.58)
Constant	***-6.835 (-6.29)	***-6.020 (-9.98)
Time and sector dummies	Yes	Yes
Observations	12,094	
Wald χ^2 (*p*-value)	238.77 (0.00)	

Source: Bank of Slovenia and own calculations.

Notes: Dependent variable is a dummy variable $OFDI_{it}$ [1 if outward FDI takes place in period t and 0 if not]. z-statistics are given in parentheses. ***, **, and * indicate significance of coefficients at 1, 5, and 10 per cent, respectively.

We elaborate further on this issue by allowing larger heterogeneity of firms' exports markets. In the previous exercise we have aggregated firm's investment decision between heterogenous export markets into rich and poor markets only. In this exercise we estimate a model of investment to any foreign market. In particular, we allow for a whole variety of investment opportunities between the full set of foreign markets, i.e. we treat each firm – foreign market observation as a separate observation. At the same time, we include region specific dummies

for FDI into countries of former Yugoslavia in order to reveal whether Slovenian firms do have special preferences for FDI into these countries due to lower entry cost (i.e. lower productivity level required).

In Table 12 we provide results using the full sample of active firms, then we limit the sample of firms to those with more than 20 employees and at last we only consider the model with a sample firms with more than 400 employees. Results, however, do not confirm the HR hypothesis that firms with lower productivity have greater incentive to invest in low-income countries. Results show that neither high productivity nor high capital intensity of firms is required when taking into account all of the firms' trade and FDI links with individual foreign markets. What is important for a firm to decide on establishing an additional affiliate abroad, however, is its size (measured in terms of the number of employees) and previous export penetration in this particular export market. This relation is robust to the size restrictions. While in the latter group of large firms the relation between outward FDI decision into individual foreign market and the firms' size of course disappears, the relation between outward FDI decision and previous export penetration in this particular export market remains very strong and significant.

Based on this we make two conclusions. First, firms are more likely to establish an affiliate in markets which have demonstrated in the past to be a very important export market. There are several motives for this pattern. Most obvious reason can be horizontal motive for FDI, i.e. replacing previous exports with local production. Damijan et al (2004) by using the same data set, however, find neither market-seeking nor factor-seeking motives to be of predominant importance for Slovenian outward FDI. In the case of dominant market seeking motives one should observe decreasing exports to the target country, while in the case of factor-seeking motives one should observe increasing imports of intermediates from a target country. But the authors find neither of the two. Instead, as shown by Damijan (2001) trade promotion may be

a key motive for FDI in countries of former Yugoslavia, where uncertainty related to exports payments is high. But surprisingly, Damijan et al (2004) find no impact of increasing outward FDI on expansion of exports, which challenges the efficiency of the trade-promotion strategy. Second conclusion is that size plays an important role in determining whether a firm will decide to invest abroad and how many affiliates it will have. We deal further with this issue in the subsequent section.

Table 12: Probit model for decision to invest in foreign affiliates, firm-market level analysis, 1994-2002

Var \ Equation	L>0[#]		L>20[##]		L>400[###]	
ln y_{t-1}	0.087	(1.069	0.102	(1.11)	0.120	(0.40)
ln y_{t-1}*D_{yu}	0.130	(1.26)	0.158	(1.31)	0.241	0.65)
ln k_{t-1}	-0.023	(-0.60)	-0.032	(-0.80)	-0.113	(-1.05)
ln k_{t-1}*D_{yu}	0.047	(0.92)	0.050	(0.88)	0.037	(0.23)
ln l_{t-1}	***0.140	(4.74)	**0.095	(2.27)	0.282	(1.10)
ln l_{t-1}*D_{yu}	0.042	(1.10)	0.032	(0.56)	-0.438	(-1.19)
$ExSh_{t-1}$	***0.308	(2.86)	***0.290	(2.49)	**0.589	(2.12)
$ExSh_{t-1}$*D_{yu}	-0.031	(-0.22)	-0.021	(-0.14)	0.557	(1.40)
D_{yu}	-0.823	(-1.04)	-1.030	(-1.11)	1.572	(0.48)
Constant	***-4.571	(-7.28)	***-4.044	(-5.82)	***-5.649	(-2.20)
Time and sector dummies	Yes		Yes		Yes	
Observations	96,905		65,237		7,850	
Pseudo R2	0.131		0.118		0.230	
Wald χ^2 (p-value)	326.35	(0.00)	242.11	(0.00)	85.42	(0.00)

Source: Bank of Slovenia and own calculations.

Notes: Dependent variable is a dummy variable $OFDI_{it}$ [1 if outward FDI takes place in period t and 0 if not]. [#], [##], and [###] indicate a model taking account of firms with at least 1, 20, and 400 employees. z-statistics are given in parentheses. ***, **, and * indicate significance of coefficients at 1, 5, and 10 per cent, respectively.

(*iii*) Count data

So far, we have focused on the first-ever decision to invest in any foreign affiliate. This allowed us to avoid the issues that arise in the presence of correlated unobserved heterogeneity of firms, presence of lagged foreign investment status and endogenous explanatory variables, such as productivity, size and capital intensity. Consequently, our results on the relationship between productivity and probability that firm has outward FDI are

not general. One possible way to deal with these limitations would be to estimate a model with endogenous limited dependent variable using semi-parametric methods. However, our data allow us to consider a different strategy where the dependent variable is a count variable – the number of foreign markets to which firms invest. Blundell, Griffith and Windmeijer (2002) proposed an ideal method for the estimation problem at hand. That is, their approach allows us to deal with persistent unobserved heterogeneity in the number of foreign affiliates in a linear feedback dynamic count data model with endogenous explanatory variables. Their approach uses standard generalized method of moments (GMM) methods for the estimation of dynamic fixed effects model. Furthermore they avoid explosive roots and problems with transforming zero values by applying a linear feedback model for the dependent variable. Following their approach, the number of foreign affiliates, N_{it}, can be modeled as:

$$(5) \qquad N_{it} = \rho N_{it-1} + \exp(\beta_0 + \beta_1 \ln y_{it} + \beta_2 \ln k_{it} + \beta_3 \ln l_{it} + \eta_i + \varepsilon_{it}).$$

First, note that this specification allows entry and exit into foreign markets, where $1 - \rho$ is the probability of exit from a foreign affiliate. Hence, the serial correlation coefficient for the number of foreign affiliates over time is thus given by $corr(N_{it}, N_{it-k}) = \rho^k$. This correlation is always positive as ρ can be only positive. The second part of (5) is the standard exponential model for count data with multiplicative fixed effects, where

$$(6) \qquad \mu_{it} = \exp(\beta_0 + \beta_1 \ln y_{it} + \beta_2 \ln k_{it} + \beta_3 \ln l_{it}),$$

and

$$(7) \qquad \nu_{it} = \exp(\eta_i).$$

The lagged dependent variable in (5) is predetermined, hence the within group mean scaling estimator will be inconsistent for small *T*. Due to technological spillovers from foreign affiliates or increased capacity utilization related to greater exports, labor productivity, capital

intensity and size are all likely to be endogenous. Therefore, we need to apply the Wooldridge (1997) quasi-differencing transformation, which is given by:

$$(7) \qquad q_{it} = \frac{N_{it} - \rho N_{it-1}}{\mu_{it}} - \frac{N_{it-1} - \rho N_{it-2}}{\mu_{it-1}}.$$

The estimator we apply is the Generalized Method of Moments (GMM). For endogenous explanatory variables and Wooldridge quasi-differencing transformation, the following moment conditions are valid:

$$(8) \qquad E(q_{it} \mid N_{it-j}, \ln y_{it-j}, \ln k_{it-j}, \ln l_{it-j}),\ j = 2,3,..., t-1.$$

The estimates of coefficients for equation (5) reported in Table 13 are obtained using the Gauss software ExpEnd developed by Windmeijer (2003) for dynamic count data. The software allows estimation for unbalanced panel, but not also for missing observations in time-series for individual firms. As our data feature re-entries of firms, we limit the sample of firms to only those that are active at least four subsequent periods. The specification tests confirm the validity of the model. In particular, the null of Sargan test, which postulates orthogonality between instruments and first differences of errors, can not be rejected. Furthermore, the tests of serial correlation – AR(1) and AR(2) – are in line with expectations. There is a negative first order autocorrelation for differenced errors and no second order autocorrelation. Not only are statistical tests in line with expectations. The estimates of coefficients are all in line with theoretical predictions and also highly statistically significant. The coefficient for the lagged number of foreign markets indicates high persistence of the number of outward FDI or, alternatively, low exit probability from foreign markets. That is, the likelihood of exit from foreign markets $(1-\rho)$ is 22.5 percent. Short-term elasticity of the number of foreign affiliates to total factor productivity is approximately $(1-\rho)\beta_1 = 0.16$, whereas the long-run elasticity, ignoring the feedback is 0.71. This implies that an increase in

productivity by 1 percent leads to an increase in the number of foreign affiliates by 0.7 percent. Similarly, the long-run elasticity of the number of foreign affiliates to capital intensity is 0.67, while elasticity for firm size exceeds 2.

In conclusion, these results suggest that even after we deal with econometric issue, we find that more productive firms are more likely to invest in foreign affiliates. Moreover, more productive, capital intensive and larger firms are also more likely to invest in greater number of foreign markets.

Table 13: Linear feedback model estimates for the decision on the number of foreign affiliates, 1994-2002

Variable \ Period	1994-2002
N_{t-1} (s.e.)	0.775 (0.034)***
ln y_t (s.e.)	0.712 (0.082)***
ln k_t (s.e.)	0.674 (0.107)***
ln l_t (s.e.)	2.043 (0.215)***
AR(1) - test (*p*-value)	-2.533 (0.011)
AR(2) - test (*p*-value)	0.696 (0.487)
Sargan (*p-value)*	24.174 (1.000)
Number of firms (observations)	4378 (23705)

Source: Bank of Slovenia and own calculations.

Notes: The dependent variable is the number of foreign affiliates. The instruments used for lagged dependent variable and explanatory variables are levels lagged between 2 and 4 periods. The coefficients reported are from the second step estimation using first step variance-covariance matrix. The standard errors reported are robust. Sargan is the standard test of overidentifying restrictions. ***, **, and * indicate significance of coefficients at 1, 5, and 10 per cent, respectively.

6. Conclusions

Investigation of outward foreign direct investment behavior for a full sample of Slovene firms active in the period 1994-2002 has gained several interesting conclusions. First, we found that outward FDI is concentrated in the countries of former Yugoslavia and European Union,

where the former receive disproportionately high share. Contrary to findings of Brainard (1997), Slovenian firms are more likely to invest in countries with lower income. Second, we confirm the conclusion by HMY that more productive are more likely to invest in foreign affiliates. Third, we reject the hypothesis by HR that less productive firms may be more likely to invest in low-income countries. Fourth, firms are more likely to invest in countries where they already have high export shares. This result favors both sales-promotion motive and horizontal FDI as it suggests that higher demand increases likelihood of investment and dismisses vertical FDI. However, some related studies using the same dataset (Damijan et al, 2004) have ruled out both vertical FDI as well as horizontal FDI by direct tests of dynamic response of imports to FDI and of exports to FDI, respectively. Hence, the key motive for FDI of Slovenian firms may be sales-promotion and security of payments. But Damijan et al (2004) again don't find any impact of increasing trend of FDI on expansion of exports, which challenges the efficiency of the trade-promotion strategy. Lastly, we find that more productive, capital intensive and larger firms are more likely to have greater number of foreign affiliates.

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