

FOREIGN COMPETITION, FIRM HETEROGENEITY AND THE DISTINCTION BETWEEN TFP AND EMPLOYMENT FIRM GROWTH

Katja Zajc Kejžar¹ and Nina Ponikvar
University of Ljubljana, Faculty of Economics

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ABSTRACT

This paper compares the role of foreign competition in firms' extensive and intensive growth based on population data for manufacturing firms registered in Slovenia in the 1994–2003 period. Extensive firm growth is measured in terms of employment, while intensive firm growth is defined in terms of total factor productivity (TFP). Based on system GMM estimates, we find significant differences between the determinants of intensive and extensive firm growth and across different parts of the TFP distribution: (i) local firms with the exception of firms from the upper tail of the TFP distribution experience a competition effect of increased imports both in terms of their reduced employment and TFP growth; (ii) inward FDI measured by foreign firms' share in industry employment has a significantly positive effect on TFP firm growth for firms from the 25-100 centile of the TFP distribution, while this factor decreases the employment growth of firms from the lower and medium quartiles of the distribution. The likelihood that the positive productivity spillover effect outweighs the negative competition effect associated with inward FDI thus increases with a firm's TFP. Given the greater scope of efficiency externalities and stronger reallocation effects where foreign firms enter via FDI compared to the trade entry mode, policy actions aiming to attract inward FDI are expected to have a larger positive impact on the aggregate productivity level and a more encouraging/less discouraging impact on employment relative to already established benefits associated with removing barriers to imports. Our results also suggest that, while trade policy measures would have a relatively uniform impact on employment growth regardless of a firm's relative TFP performance, TFP growth would adjust significantly differently across the TFP distribution. In addition, despite the empirically confirmed relevance of considering firm heterogeneity, competition pressure from foreign firm operations seems to carry more weight for firm growth compared to firms' ability to learn through their exporting activity or from their eventual foreign owner right across the TFP distribution.

Keywords: growth, TFP, employment, firm heterogeneity, foreign competition, TFP distribution

JEL classification: F21, F23, L11, L25, C23

1. INTRODUCTION

Firm growth and productivity are theoretically regarded as a key aspect of competitiveness. Accordingly, nationwide both trade and industrial policy measures are formed to stimulate productivity and growth. It is well established in the literature and empirically confirmed that policies inclined toward foreign trade are among the more important factors of economic growth (Rodrigues and Rodrik, 2000) and that indicators of external openness are strongly associated with growth rates (Stiglitz, 1998).

¹ E-mail: katja.zajc@ef.uni-lj.si.

The relationship between firm growth and its determinants has been an ongoing issue in theory and a rich body of empirical studies provides evidence on how firms enter into industry, grow or stagnate and ultimately survive or exit from it. Recently, the theoretical and empirical recognition of firm heterogeneity accentuate, first, the need to shift the empirical focus towards studying the growth rate distribution rather than concentrating on the average effect of the average firm (Coad and Rao, 2008; Reichstein, Dahl, Ebersberger and Jensen, 2010) and, second, to consider the reallocation and selection aspects in shaping the proper trade and industrial policy mix.

Models of industry dynamics with heterogeneous firms have been integrated into general equilibrium trade models (the first key contributors include Melitz (2003) and Bernard, Eaton, Jensen, and Kortum (2003)) to account for the effects of increased foreign competition through the lowering of trade barriers on evolution processes within industries. While these models are similar in their main prediction that trade liberalisation forces the least efficient firms to contract or exit while promoting the growth and success of more efficient ones, they differ with respect to the channels and motivations. The importance of reallocation effects among heterogeneous firms has recently also been recognised in the theoretical work on trade policy (Demidova and Rodríguez-Clare, 2009). A series of empirical studies that examine the evolution of industries in response to increased trade supports the predictions of these models. Most empirical effort has been directed to investigating the channels through which trade liberalisation affects firm productivity (see Pavcnik, 2002; Schor, 2004; Amiti and Konings, 2007; Fernandes 2007; DAVIS and Milgram-Baleix, 2009). In general, it seems that tariff reductions and increasing import penetration contribute positively to intra-firm productivity growth, but there is a high degree of sensitivity of this positive impact with respect to both industry and firm characteristics, in particular a firm's efficiency, its export orientation and foreign ownership. Pavcnik (2002) finds evidence of within-plant productivity improvements due to liberalised trade for Chilean manufacturing plants in an import-competing sector and confirms that aggregate productivity improvements stem from the reshuffling of resources and output from less to more efficient producers. Similarly, Fernandes (2007) reports that total factor productivity (TFP) gains are greater for large firms and in less competitive industries. By distinguishing between productivity gains arising from lower tariffs on final goods relative to lower tariffs on intermediate inputs, Amiti and Konings (2007) show that productivity gains result from input tariff reductions to a greater extent. Further, Davis and Milgram-Baleix (2009) demonstrate in a Spanish case that a large part of the positive productivity effect comes from the presence of foreign products and more indirect effects of openness rather than from reducing tariffs. The differential impact of trade policy measures on firms is confirmed by Konings and Vandenbussche (2008) for anti-dumping (AD) protection measures. They find that domestic firms with relatively low initial productivity have productivity gains during AD protection, while frontier firms experience productivity losses. As far as firms' extensive growth is considered, the results are more mixed. Bernard, Jensen and Schott (2003), for example, find for US manufacturing that both employment and output growth are slower for plants that face higher levels of low-wage import competition in their industry.

Similarly as for foreign trade effects, empirical evidence on the impact of competition from foreign firms that enter into a host country market via FDI has been heavily concentrated on testing productivity effects. Several meta-studies review empirical evidence on horizontal productivity spillover effects (for instance, Görg and Strobl, 2001; Görg and Greneaway, 2003), report mixed empirical evidence and conclude that no general conclusion can be drawn regarding the impact of FDI on the productivity growth of local firms.² These studies suggest that more discriminating analyses are

² On the contrary, empirical evidence on vertical spillover effects is more convincing. Based on a review of 57 empirical studies, Havranek and Irsova (2010) conclude there is robust evidence of technology transfers from foreign investors to domestic firms in supplier sectors (backward spillovers), but no economically important effect on firms in customer sectors (forward spillovers) or in the same sector (horizontal spillovers).

required to take account of various firm-specific aspects. One way to deal with this differentiated impact is to study the impact of inward FDI across the firm productivity distribution. Surprisingly, there have been relatively rare attempts at a quantile regression approach to investigating foreign firms' competition effects on productivity growth. There are a few exceptions that convincingly confirm substantial heterogeneity in FDI impacts across quantiles of productivity distribution (Girma and Görg (2007) for the electronics and engineering sectors; Dimelis and Louri (2002) and Fotopoulos and Louri (2004) for Greek manufacturing firms). However, the relatively narrow focus in terms of time and sector coverage of these quantile regression-based studies demands additional evidence on the differential impact of foreign competition on firm growth in dependence on a firm's position in the productivity distribution.

While the impact of FDI on productivity growth is well covered empirically, the impact of foreign competition from foreign-owned firms that enter via FDI on firm employment or output growth is far less frequently studied. Kosová (2010) provides evidence that foreign expansion, measured by the sales growth rate of foreign firms, has a positive effect on the growth of Czech firms. Zajc Kejžar and Kumar (2006) confirmed in the case of Slovenian manufacturing firms that the impact of FDI competition depends on a firm's efficiency, where the least efficient firms experience a drop in their employment growth upon a foreign firm's entry via FDI.

The short review of empirical studies that investigate the link between openness and firm growth bears witness to the heterogeneous growth impacts of foreign competition between firms. Further, the results seem to be sensitive to the firm growth definition. Notwithstanding this, most studies do not distinguish among alternative aspects of firm growth. Empirical studies on firm growth are namely based on one of three different measures of firm growth; growth of sales³ (e.g. Huynh and Petrunia, 2010; Coad and Rao, 2008), extensive (employment or asset) growth (e.g. Choi, 2010; Bigsten and Gebreeyesus, 2007; Oliveira and Fortunato, 2006) and intensive (productivity) growth (Huerger and Jaumandreu, 2004), where the latter is defined either as labour productivity or total factor productivity growth. As the impact of foreign competition is arguably different for intensive and extensive firm growth, we attempt to fill this gap and contribute to the empirical literature by explicitly accounting for differences in factors driving extensive firm growth in terms of employment, and factors related to the intensive growth of firms, measured by the growth of total factor productivity. Indeed, Treffer (2004) reveals a great difference between employment and productivity growth effects of FTA-mandated tariff cuts based on the Canada-U.S. Free Trade Agreement. He finds that the Agreement was on one hand associated with substantial employment losses, while on the other it led to large labour productivity gains resembling, as he interprets, the conflict between those who bore the short-run adjustment costs (displaced workers and struggling plants) and those who are garnering the long-run gains (consumers and efficient plants). Also, the abovementioned studies usually only consider one aspect of foreign competition, either imports or incoming FDI.

Our aim is, hence, threefold. First, we study the impacts of foreign competition on firm growth considering both imports and incoming FDI. Second, we test for differences in the impact of foreign competition and other relevant growth determinants⁴ on intensive and extensive firm growth. Third, to

³ Growth of sales summarises the growth of the physical production of output and prices. The growth of physical output can be attributed to the growth of the production factors used (e.g. employment), later on referred to as extensive growth, and their productivity which is subsequently referred to as intensive growth.

⁴ Among the principal firm characteristics that affect a firm's growth the theories postulate firm size, age and productivity. A starting point in the firm growth literature is the Law of Proportionate Effects, also known as Gibrat's Law (Gibrat, 1931; Sutton, 1997) predicting independence between the growth of a firm and its size. While early studies tended to confirm Gibrat's Law, subsequent research began to question its overall validity, based on observations of a negative relationship between growth and initial size (surveys of the existing empirical literature in Sutton (1997), Lotti et al. (2003) and

address the importance of firm heterogeneity for growth-related issues, we focus on the differences in the array and impact of intensive and extensive growth determinants between different subsamples of firms belonging to different parts of the TFP distribution. We argue that if differential impacts between firms belonging to different parts of the TFP distribution do exist, policymakers must take into account that the firm-level consequences of their policy actions might depend on a firm's placing in the TFP distribution. In other words, the same policy measure might affect above- or below-average productive firms in different ways. Such policy intervention consequences would then lead to selection and reallocation and to the additional advantage of already above-average productive firms.

We base our empirical analysis of firm growth processes on a panel of the population of Slovenian manufacturing firms in the 1994–2003 period. This period is characterised by increasing exposure to foreign competition related to both multilateral liberalisation and approaching EU membership and is as such particularly suitable for studying the growth implications of foreign competition. We estimate two versions of the firm growth model based on a comparable specification to explicitly account for differences in factors driving extensive and intensive firm growth. We test (i) the extensive growth model where a firm's size is measured by its employment; and (ii) the intensive growth model where a firm's growth is measured in terms of total factor productivity growth. The total factor productivity of firms is estimated based on Levinsohn and Petrin's (2003) approach. We apply a dynamic panel model to account for growth persistence. The persistence of growth refers to the relationship between inter-temporal firm growths. Empirical studies on the topic provide mixed results, although some of the latest studies (Oliveira and Fortunato, 2006 and Huynh and Petrunia, 2010) present evidence on the existence of such a dynamic growth dimension. Further, to consider the differential effect resulting from firm heterogeneity we also analyse the impact of foreign competition and other relevant growth determinants across quantiles of the firm productivity distribution.

The paper is organised as follows. The next section discusses the empirical model specification of the intensive and extensive growth models together with the research hypotheses. In the third section, we describe the dataset and methodology applied for estimating the dynamic firm growth models and total factor productivity. Section 4 presents and discusses the results, while the last section concludes.

2. EMPIRICAL MODEL SPECIFICATION

Our growth model specification follows Evans' (1987) approach where growth is modelled as a function of initial size:

$$S_{t+1} = G(\lambda_t, \gamma_t, \theta_t, \tau_t) \cdot S_t \cdot e_t, \quad (1)$$

where S_t denotes the size of the firm. Among the set of factors that affect a firm's growth we include various factors proposed by the different theoretical and empirical studies. The factors proposed by these theories can be classified in the following groups: (i) firm characteristics (λ_t); (ii) industry or product market characteristics (γ_t); (iii) factor prices (τ_t); and other exogenous factors (θ_t) that reflect conditions outside the domestic industry (τ_t and θ_t factors are both captured by the inclusion of annual dummies). Most of the recent studies adopt the framework of so-called firm and industry dynamics models which focus on the selection process among heterogeneous firms within a particular industry that operates through the entry and exit process and emphasise the importance of firms' learning process for the selection and evolution process within the industry. These models are thus also known as "learning models" as the entrant typically does not know its own cost structure (efficiency), but its

Audretsch et al. (2004)). These observations are consistent with predictions of firm dynamics models (e.g. Jovanović, 1982) that smaller and younger firms grow faster and are less likely to survive than old and large firms.

relative efficiency is discovered through the processes of passive (Jovanovic, 1982) or active learning (Erikson and Pakes, 1995) from actual market experience subsequent to entry.

Through a logarithmic transformation of (1) we obtain the firm-growth rate equation

$$\ln S_{t+1} - \ln S_t = \ln G(\lambda_t, \gamma_t, \theta_t, \tau_t) + u_t, \quad (2)$$

where u_t is a normally distributed error term with a mean zero.

To test the hypothesis that the set of factors behind extensive firm growth measured in terms of employment differs from the set of intensive firm growth in terms of total factor productivity, two versions of growth models with comparable specifications of growth factors are estimated: (i) the extensive growth model where a firm's size is measured by its employment; and (ii) the intensive growth model where a firm's growth is measured in terms of TFP. For the functional form of $G(\cdot)$, we follow Evans' (1987) approach and test a higher order logarithmic expansion in two principal firm-specific variables (a firm's size and age) until there is no evidence of further nonlinearity. Like in several other studies, the second-order logarithmic expansion in a firm's size in the case of the intensive growth model and only the first-order logarithmic expansion in other variables were confirmed. The regression equations of the extensive and intensive firm growth model are the following:

$$\begin{aligned} \Delta \ln Empl_{ijt} = & \beta_0 + \sum_{k=1}^3 \beta_k \ln Empl_{ijt-k} + \beta_4 \ln TFP_{ijt-1} + \beta_5 \ln Kint_{ijt-1} + \beta_6 \ln Wage_{ijt-1} + \beta_7 \ln Age_{ijt} + \\ & + \beta_8 fdi_{ijt-1} + \beta_9 EXOR_{ijt-1} + \beta_{10} IndMarkup_{jt-1} + \beta_{11} hFDI_{jt-1} + \beta_{12} IMint_{jt-1} + \sum \beta_{13,j} dindustry + \\ & + \sum \beta_{14,t} dyear + u_{it} \end{aligned} \quad (3)$$

$$\begin{aligned} \Delta \ln TFP_{ijt} = & \beta_0 + \sum_{k=1}^3 \beta_k \ln TFP_{ijt-k} + \beta_4 \ln Empl_{ijt-1} + \beta_5 \ln Kint_{ijt-1} + \beta_6 \ln Age_{ijt} + \\ & + \beta_7 fdi_{ijt-1} + \beta_8 EXOR_{ijt-1} + \beta_9 IndMarkup_{jt-1} + \beta_{10} hFDI_{jt-1} + \beta_{11} IMint_{jt-1} + \sum \beta_{12,j} dindustry + \\ & + \sum \beta_{13,t} dyear + u_{it} \end{aligned} \quad (4)$$

where subscripts i , j and t refer to firms, industries and years, respectively. In the extensive firm growth model, the dependent variable is defined as the difference in the log values of a firm's employment $Empl_{ijt}$ ($\ln Empl_{ijt+1} - \ln Empl_{ijt}$), while in the model of intensive growth firm growth is defined in terms of total factor productivity (TFP) as the difference in the log values of TFP_{ijt} ($\ln TFP_{ijt+1} - \ln TFP_{ijt}$). \ln in variable names denotes the natural logarithm of a particular variable, while 2 denotes that the variable enters the estimation in a squared form. The dynamic specification of the models (eqs. 3 and 4) tests for a firm's size and TFP dynamics with the inclusion of the lagged dependent variable among regressors. Three lags of the dependent variable are included among regressors in order to avoid inconsistent estimates due to serial correlation. All values of the financial variables are deflated using producer prices indices at the 2-digit NACE classification and all industry-level variables are calculated based on the 3- or 5-digit NACE classification of industries. u_{it} is composed of $u_{it} = \mu_i + v_{it}$, where μ_i is an unobserved, individual-specific and time-invariant effect which allows for heterogeneity in the means of growth across individual firms and v_{it} is a disturbance term. The time-specific, individual-invariant effect is captured with a set of time dummies among the regressors.

To test the hypothesis that the set and impact of intensive and extensive growth determinants vary between different subsamples of firms belonging to different parts of the TFP distribution, extensive

and intensive growth are estimated (a) for firms from the whole TFP distribution, and (b) for subsamples of firms defined in terms of TFP distribution quantiles.

Among the principal firm characteristics that affect a firm's growth, the theories postulate a firm's size, age and productivity; smaller, younger and more productive firms are hypothesised to grow faster. Firm size ($Empl_{ijt}$) is measured by the number of employees. Age_{ijt} denotes a firm's age counting from the year of formation according to the Slovenian Business Register⁵. Productivity is measured as total factor productivity (TFP_{ijt}) and explained in more detail in the methodology section. Further, we include capital-intensity $Kint_{ijt}$, measured by real fixed assets per worker. The capital intensity of a firm is expected to positively affect its ability to survive and grow according to the Olley and Pakes (1996) model. $Wage_{ijt}$ is defined as the average yearly real wage per employee. Similar to Mata and Portugal (2004), wage is used as a proxy for the skill intensity of a firm, which is expected to positively affect a firm's growth potential as it can serve as a proxy for its absorptive and learning capacity. The wage variable is only included in the extensive growth model specifications due to the strong multicollinearity detected in TFP growth specifications. We control for the impact of a firm's ownership with a dummy variable fdi_{ijt} , which takes a value of 1 for "foreign firms" considering a 10% ownership share threshold. A firm's export orientation $EXor_{ijt}$ is defined as the share of its revenues from exports in its total annual sales. It is expected that exporters will have higher extensive growth compared to non-exporters because exporting enables firms to increase their output sales and thus to grow *ceteris paribus*. The contribution of a firm's export activity to its productivity is usually associated with economies of scale utilisation and the ability to learn by exporting. The latter has been extensively investigated empirically (see Wagner, 2007 for a comprehensive survey). Studies show that exporters are found to be more productive than non-exporters and more productive firms self-select into export markets, while exporting does not necessarily improve productivity.

We explicitly test the influence of the domestic industry's characteristics on firm growth. Besides the time-invariant market characteristics that are captured in the set of industry dummies at the 2-digit level of NACE $dindustry_j$, we include the average industry-level markup to capture the characteristics of industry's market structure, especially market concentration and average applied technology. By using sales, inventories and costs in a similar manner as Domowitz, Hubbard and Petersen (1986), Kalecki's version of the markup definition (1954) as the ratio between industry's revenues and the sum of industry's direct (variable) costs is used. It is argued that a high average industry-level markup size is characteristic of industries with a lower intensity of competition, i.e. high market concentration. The expected effect of such competition intensity is not so clear-cut. On one hand, a low intensity of market competition is expected to be positively related to firm survival and growth. The argument is that the price level is more likely to be elevated above the long-run average cost at the minimum efficient scale level of output in concentrated industries which may facilitate the survival of suboptimal scale firms, which is what typical entrant firms are. On the other hand, firms in such industries may be subject to fierce aggressive behaviour by rivals, which may reduce their chances of growth. To control for the time-specific effects throughout the investigated period we include annual dummies $dyear_t$ ⁶.

Foreign competition can have a significant impact on firm growth through sales of foreign affiliates and through imports. The impact of foreign competition stemming from foreign firms that have

⁵ As age enters our empirical models in a logarithmic form, we start to count age with a value of 1 in order to prevent the dropping of observations in the first year of a firm's operation, which would generate sample selection bias due to the relatively high infant mortality rates.

⁶ We test several other variables, but due to insignificant coefficients in all empirical specifications we do not include them in our final empirical models. Among others, we test for the effect of the ratio of long-term debt to total assets, for the minimum efficient scale defined as the log of median employment size in industry j and industry growth with respect to the previous year defined as the growth of total employment within particular industry j .

entered the Slovenian manufacturing sector via FDI is tested by the variable $hFDI_{jt}$ that measures the concentration of foreign firms in industry j as foreign firms' share of total industry employment:

$$hFDI_{jt} = \frac{\sum_{i=1}^n empl_{ijt} \cdot fdi_{ijt}}{\sum_{i=1}^n empl_{ijt}} \quad (6)$$

where n denotes the number of all firms in industry j and $empl_{ijt}$ denotes the number of employees in firm i . The measure excludes the firm for which the observation is taken. The employment share of foreign firms is used in many studies to test the presence of horizontal spillover effects, among others (Barrios et al., 2005), (Keller and Yeaple, 2003), (Görg and Strobl, 2003)⁷. The concentration of foreign firms in a particular industry potentially generates two opposite effects. On one hand, a higher concentration of foreign firms in an industry is expected to be associated with stronger competition pressure on other firms operating in this industry. Foreign firms are usually more efficient and pay higher wages on average, resulting in additional competition pressure in goods and factor markets and tending to limit firm growth prospects. On the other hand, the activity of foreign firms may confer positive externalities (e.g. productivity spillover effects) on domestic firms which may decrease firms' unit costs and consequently increase their output. Import intensity $Imint_{jt}$ is defined as the share of industry imports in the industry's sales in the domestic market (the home sales of domestic firms in the industry at the 3-digit NACE classification of industries plus the sum of the industry's imports). The availability of imports in domestic markets (assuming that foreign and domestic products are at least partial substitutes) is expected to increase the intensity of competition in domestic markets. On the other hand, technical innovation through imports of intermediate goods is also evidenced theoretically and empirically (for instance, in DAVIS and Milgram-Baleix (2009), Amiti and Konings (2007)). However, we expect the scope of efficiency externalities to be greater in the case of FDI than in the case of imports.

3. DATA AND METHODOLOGY

3.1. The data

The primary data source for the empirical investigation of the determinants of firms' growth is the database of firms' financial statements collected by the Agency of the Republic of Slovenia for Public Legal Records and Related Services, which covers the whole population of Slovenian manufacturing firms and is extended with some internal databases of the Statistical Office of the Republic of Slovenia. A firm's industry membership is defined according to the five-digit NACE Rev.1 classification of industries and all financial data are in fixed prices from the year 2000. The panel nature of the firm-level data allows us to combine inter-temporal as well as inter-firm information efficiently, to control for unobservable firm-specific variables by focusing on differences over time and to efficiently overcome the econometric issues. In addition, it enables us to test the time persistence of firm growth and to study the variability of firms' size and growth over time. In order to assure "cleaner" data entering, the dataset was narrowed by leaving out firms with a negative value of equity. Further, we apply the method of removing excessive outliers from the dataset introduced by Hadi (1994) since excessive outliers could bias the subsequent results and conclusions. When all characteristics of the model specification and the estimation method are taken into consideration (time

⁷ Instead of the employment share, other studies also consider foreign firms' share in the industry's output (Smarzynska, 2004), and the relative number of foreign firms (De Backer and Sleuwaegen, 2003). Some studies also take account of the share of foreign equity participation in foreign firms, including (Aitken et al., 1999) and (Smarzynska, 2004).

lags and differenced model equation), our analysis is based on more than 17,000 observations for approximately 4,100 manufacturing firms.

Table 1 Descriptive statistics for Slovenian manufacturing firms 1994–2003 according to TFP distribution quartiles

Variable mean	All firms				
	Total	1st quartile	2nd quartile	3rd quartile	4th quartile
No. of employees	47.7	4.3	14.6	48.5	128.9
Age of firms	14.9	7.2	8.1	9.0	9.4
TFP	84.0	34.1	56.8	80.4	145.9
Capital intensity	5,925	1,327	1,723	2,199	2,742
Annual wage in thousand SIT	1,143	842	1,119	1,269	1,389
Export orientation (% of sales)	0.17	0.07	0.13	0.22	0.27
Industry markup	0.86	0.865	0.859	0.861	0.868
Foreign firms' share in ind. empl. (%)	0.11	0.10	0.11	0.12	0.12
Import intensity (%)	0.47	0.42	0.45	0.49	0.52

Note: Summary statistics exclude firms with zero employees and those reporting non-positive equity.

Source: Own calculations

Table 1 presents some basic characteristics of the panel of Slovenian manufacturing firms. Based on our hypothesis that the set of growth determinants and their impact vary across different parts of the TFP distribution, we also present average characteristics of firms from four quartiles of the TFP distribution. In the 1994–2003 period the average manufacturing firm in Slovenia was 15 years old, had around 50 employees and was selling 17 percent of its products abroad. The descriptive statistics across the TFP distribution quartiles also show that firm size in terms of employment, its age, its capital intensity of production, average annual wage per employee and its export orientation increase when firms from different parts of the TFP distribution are observed in ascending order. In addition, firms with higher TFP are on average conducting their business in industries with greater exposure to foreign competition either from imports or from the intra-industry concentration of foreign firms. The described characteristics are in line with the theoretical predictions of Ericson and Pakes (1995) and Jovanovic (1982) that more productive firms are older and larger in terms of number of employees. The established differences in the average characteristics of firms from different parts of the TFP distribution confirm the arguments that an analysis across quantiles is required in order to adequately understand the set of growth determinants and their impact.

Figure 1: Kernel density plot of the TFP distribution and associated Gaussian distribution

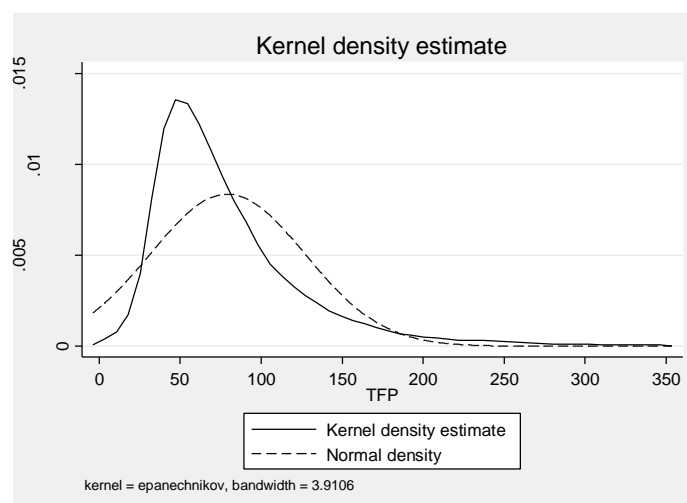


Figure 1 depicts the distribution of TFP using the normal kernel function and the associated Gaussian distribution. The TFP distribution noticeably deviates from the normal distribution and is left-skewed, suggesting that on one hand the applied sample should not be studied only through averages but also at different positions within the TFP distribution. On the other hand, the TFP distribution characteristics are largely found to be comparable across manufacturing industries at the 2-digit NACE level, which additionally supports the importance of considering firm heterogeneity in the further investigation (see Appendix 1).

3.2 Methodology

Intensive firm growth is defined in the intensive firm growth model as a change in a firm's TFP. Typically, TFP is estimated as the residual in production function estimates based on firm-level panel data. Simultaneity bias is usually referred to as the endogeneity of production inputs, created by a correlation between unobservable productivity shocks and input levels causing the regressors and the error term to be correlated which makes OLS estimates inconsistent. Bias thus occurs when at least part of the TFP is observed by the firm early enough to allow it to change its factor input decision. Several methods of controlling for simultaneity bias are proposed in the literature. Olley and Pakes (1996) developed an estimator that uses investment as a proxy for these unobservable productivity shocks. One of the drawbacks of Olley and Pakes' (1996) approach is that there must be a strictly monotonous relationship between the proxy (investment) and output to obtain consistent estimates. This means that observations with a zero investment have to be dropped from the sample. Further, Levinsohn and Petrin (2003) point out that an investment is associated with substantial adjustment costs which make the investment very lumpy and not respond smoothly to a productivity shock, thus violating the consistency condition. They thus develop a similar two-step estimator which uses intermediate inputs as proxies, arguing that intermediates may respond more smoothly to productivity shocks and may respond more fully to the entire productivity term than investment. We follow the approach of Levinsohn and Petrin (2003) in the estimation of TFP. Using intermediate input proxies instead of investment also allows us to avoid truncating observations with a zero investment.

To test the determinants of firm intensive and extensive growth and at the same time to describe and analyse the entire conditional distribution of the dependent variable, authors (Coad and Rao, 2008; Reichstein, Dahl, Ebersberger and Jensen, 2010) suggest the application of a quantile regression. However, the limitations imposed by the dynamic nature of our model and the endogeneity of the regressors prevent the quantile regression estimates from being efficient. To estimate the dynamic growth models based on a panel containing many firms and a small number of time periods, we use a system GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998). In order to address the link between firm heterogeneity and growth determinants and to provide a more detailed picture of growth determination across firms from the whole TFP distribution, we focus on differences in the growth determination process between the most-productive and the least-productive firms relative to the medium-productive ones. Thus, the Blundell-Bond GMM estimator is used firstly on the whole sample of manufacturing firms and, second, separately for a subsample of 25 percent of the least productive firms (0-25 TFP distribution quantile), a subsample of 25 percent of the most productive firms (75-100 TFP distribution quantile) and for a subsample of firms from the medium quantiles⁸ of the TFP distribution (25-75 TFP distribution quantile). Due to the panel nature of our dataset and an increasing trend in TFP levels during the period considered, we consider the TFP distribution based on the deviations of firms' TFP levels from the annual average TFP in forming the subsample of firms.

⁸ The shape of TFP distribution within medium quantiles (25-75 percentiles) closely corresponds to a normal distribution. Accordingly, firms from this subsample are analysed jointly.

The consistency of the system GMM estimator hinges heavily upon the assumption there is no second-order serial correlation for disturbances of the first-differenced equation, tested with the test statistic m_2 for a second-order serial correlation based on residuals from the first-differenced equation. Due to the presence of heteroscedasticity in our model, a two-step procedure is used to compute the variance covariance matrix based on Windmeijer-robust errors. We assess the adequacy of instruments in an over-identified context with a Sargan test of over-identifying restrictions (Sargan, 1958).

4. RESULTS

In this section we present the results of the extensive and intensive dynamic growth model specifications based on the panel of Slovenian manufacturing firms and using the system GMM estimator. Both the extensive and the intensive growth model are estimated first based on the whole sample of firms (the whole TFP distribution) (Table 2) and, second, separately for subsamples from different parts of the TFP distribution (Table 3). The estimations of the extensive and intensive growth models based on various specifications in Table 2 confirm the robustness of our models. In addition, in Tables 2 and 3 the null hypothesis of the Wald test is rejected regardless of the model's specification and the applied sample. The Sargan test of over-identifying restrictions confirms that the moment conditions are legitimate. Crucial for dynamic models based on differenced equations is the absence of a serial correlation of order 2. For both the extensive and the intensive growth model, three lags of the dependent variable in the specification were found to be appropriate for efficient estimates.

Table 2 Blundell and Bond estimates of firms' extensive and intensive growth models

Depend. var. (Y):	Extensive growth		Intensive growth	
	lnEmpl (I)	lnEmpl (II)	lnTFP (I)	lnTFP (II)
Y(-1)	0.950 (50.9)***	0.941 (58.5)***	0.506 (17.8)***	0.522(20.3)***
Y(-2)	0.025 (1.6)*	0.023 (1.7)*	0.131 (8.4)***	0.132 (8.9)***
Y(-3)	-0.021 (-2.3)**	-0.023(-2.7)***	0.036 (3.0)***	0.036 (3.2)***
lnEmpl(-1)			0.092 (2.7)***	0.105 (3.6)***
lnEmpl ² (-1)			-0.013(-2.5)***	-0.014(-3.0)***
lnTFP(-1)	0.128 (2.6)***	0.124 (3.0)***		
lnKint(-1)	0.078 (5.6)***	0.080 (6.6)***	0.049 (3.7)***	0.050 (4.2)***
lnWage(-1)	-0.001 (-0.0)	0.038 (1.0)		
lnAge	-0.187(-3.7)***	-0.159(-3.6)***	-0.027 (-0.6)	-0.056 (-1.4)
IndMarkup(-1)	-0.082 (-1.2)	-0.100 (-1.6)*	-0.226(-4.2)***	-0.230(-4.4)***
fdi(-1)		0.009 (0.2)		-0.027 (-0.9)
EXor(-1)		0.134 (2.3)**		-0.018 (-0.3)
hFDI(-1)		-0.039 (1.4)		0.079 (3.0)***
IMint(-1)		-0.071 (-1.9)**		-0.074(-2.2)**
Year dummies	Yes	Yes	Yes	Yes
Ind. dummies	Yes	Yes	Yes	Yes
Constant	-0.203 (-0.47)	-0.554 (-1.82)*	1.035 (4.77)***	1.207 (6.37)***
No. obs.	17805	17790	17620	17605
No. firms	4188	4186	4136	4134
Instrumented	lnTFP, lnWage, lnKint	lnTFP, lnWage, lnKint, fdi, EXor	lnEmpl, lnEmpl ² , lnKint	lnEmpl, lnEmpl ² , lnKint, fdi, EXor
(df) Wald χ^2	(36) 10763.14***	(39) 16213.54***	(36) 772.29***	(39) 1361.85***
(df) Sargan χ^2 (p)	(133) 127.13 (0.63)	(199) 187.48 (0.71)	(133) 140.70 (0.31)	(199) 206.59 (0.34)
AR(1) z(p)	-11.118 (0.00)***	-11.063 (0.00)***	-16.563 (0.00)***	-16.99 (0.00)***
AR(2) z(p)	1.573 (0.12)	1.361 (0.17)	0.734 (0.46)	0.874 (0.38)

Notes: z-statistics are in parentheses, ***, **, * denote significance at 1%, 5% and 10%, respectively

Source: Own calculations

In Table 2 the coefficient on the first lag of the dependent variable is positive for all specifications. In the extensive growth model, this coefficient is approximately 0.95. This implies that a 1 percent increase in the previous period's firm size leads to a 0.95 percent increase in the current period's size. This is also in line with the findings of some other empirical studies that report a 0.9 first lag persistence coefficient for employment growth (e.g. Oliveira and Fortunato, 2006) and for the growth of sales (Huynh and Petrunia, 2010). The one-year persistence of intensive growth measured by TFP growth turns out to be much smaller as the coefficient for the first-lagged dependent variable amounts to 0.5. Still, the coefficients for the second and third lags are larger in the case of intensive growth compared to employment growth suggesting that, although the short-term persistence is large in the case of extensive growth, the effects of intensive growth are preserved for longer. The stronger long-term persistence of intensive growth suggests that the impact of technology improvement shocks fades away within a 3-year period. The quartile estimates from Table 3 also show that growth persistence in both TFP and the employment aspect is weakest in the quartile of the least productive firms which are also the smallest firms according to our descriptive statistics in Table 1 and are as such also theoretically expected to have a relatively larger variance in growth rates compared to bigger firms. The persistence in TFP growth continues longest in the group of medium-productive firms, suggesting that the effects of learning and imitation in this group of firms lasts longer than the effects of innovations in the group of the most productive firms.

Table 3 Blundell and Bond estimates of firms' extensive and intensive growth model for TFP distribution quartiles

Depend. var. (Y):	lnEmpl			lnTFP		
	1st quartile (0-25)	2nd and 3rd quartile (25-75)	4th quartile (75-100)	1st quartile (0-25) ^a	2nd and 3rd quartile (25-75)	4th quartile (75-100)
Y(-1)	0.787 (17.7)***	0.995 (47.3)***	0.959 (44.8)***	0.368 (7.0)***	0.670 (23.2)***	0.732 (21.3)***
Y(-2)	0.001 (0.1)	0.018 (1.2)	-0.029 (-1.8)*	0.169 (3.8)***	0.208 (10.5)***	0.099 (4.9)***
Y(-3)	-0.020 (-1.2)	-0.031 (-3.0)***	-0.005 (-0.4)	0.032 (1.0)	0.063 (4.8)***	0.093 (5.2)***
lnEmpl(-1)				0.208 (2.7)***	0.101 (2.5)**	0.002 (0.1)
lnEmpl ² (-1)				-0.012(-2.8)***	-0.019(-2.9)***	-0.003 (-0.5)
lnTFP(-1)	0.047 (0.9)	0.065 (1.4)	-0.035 (-1.1)			
lnKint(-1)	0.043 (1.7)*	0.103 (7.4)***	0.095 (5.0)***	0.066 (2.2)**	0.020 (1.4)	-0.011 (-0.5)
lnWage(-1)	0.256 (6.1)***	-0.037 (-0.8)	0.133 (2.98)***			
lnAge	0.259(2.2)**	-0.222 (-3.8)***	-0.190 (-3.3)***	-0.426 (-1.4)	0.059 (1.2)	0.064 (1.1)
IndMarkup(-1)	-0.100 (-0.7)	-0.028 (-0.4)	-0.114 (-1.6)	-0.349 (-2.0)**	-0.190 (-2.7)***	-0.022 (-0.3)
fdi(-1)	0.411 (4.4)***	0.006 (0.1)	-0.001 (-0.0)	-0.203 (-2.9)***	-0.049 (-1.3)	-0.061 (-1.8)*
EXor(-1)	-0.155 (-1.3)	0.172 (2.6)***	0.252 (3.7)***	-0.089 (-0.6)	-0.043 (-0.7)	0.033 (0.4)
hFDI(-1)	-0.075 (-1.0)	-0.090 (-2.0)**	0.012 (0.4)	-0.047 (-0.6)	0.100 (2.4)**	0.073 (2.3)**
IMint(-1)	-0.198 (-1.5)	-0.100 (-2.6)***	0.086 (2.2)**	-0.239 (-2.5)**	-0.096 (-1.9)*	-0.014 (-0.4)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Ind. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.174 (-4.6)***	-0.200 (-0.5)	-0.495 (-1.4)	2.528 (2.7)***	0.152 (0.6)	0.245 (0.8)
No. of obs.	3485	9476	4778	1932	9419	4746
No. of firms	1419	2871	1433	881	2849	1417
Instrumented	lnTFP, lnWage, lnKint, fdi, EXor	lnTFP, lnWage, lnKint, fdi, EXor	lnTFP, lnWage, lnKint, fdi, EXor	lnEmpl, lnEmpl ² , lnKint, EXor, fdi	lnEmpl, lnEmpl ² , lnKint, EXor, fdi	lnEmpl, lnEmpl ² , lnKint, EXor, fdi
(df)	(38)	(39)	(39)	(38)	(39)	(39)
Wald χ^2	715.4***	10340.8***	13024.9***	50291***	1811***	1103***
(df) Sargan χ^2	(179) 158.76	(196) 155.22	(194) 186.03	(130) 132.4	(196) 226.8	(194) 186.2
(p)	(0.86)	(0.99)	(0.65)	(0.42)	(0.07)*	(0.91)
AR(1) z(p)	-6.409 (0.00)	-9.934 (0.00)	-7.647 (0.00)	-5.576 (0.00)	-14.224 (0.00)	-10.545 (0.00)
AR(2) z(p)	1.186 (0.24)	-0.794 (0.43)	-0.911 (0.36)	0.988 (0.32)	-0.803(0.42)	-0.718 (0.47)

Notes: ^a – 5 lags of the dependent variable considered in the estimation, results only reported for 3 lags; z-statistics are in parentheses, ***, **, * denote significance at 1%, 5% and 10%, respectively

Our empirical results from Table 3 show the relatively large variability of growth determinants across firms from different TFP distribution quartiles in the array, magnitude or even direction of impact. In Table 4 we test the equality of the reported regression coefficients from the regressions across quartiles from Table 3. The tested null hypothesis is that the regression coefficients of a particular regressor between subsamples are pair-wise equal. In the last row of Table 4, the joint test of regression coefficient equality confirms our hypothesis that firm heterogeneity is a factor to be considered when analysing firm growth. Hence, these results justify our empirical approach of separately estimating growth determinants for the subsample of firms from different parts of the TFP distribution. Two important observations arise from these results. First, the TFP firm growth determinants are more sensitive to firm heterogeneity compared to the determinants of employment growth. Second, the strongest differential impact on firm growth across quartiles is related to our industry-specific growth determinants. In the case of TFP growth, the impact of domestic and both sources of foreign competition (imports and FDI) are statistically significantly different between all subsample pairs. This confirms the predictions of theoretical models about the potentially strong reallocation and selection effects of foreign competition among heterogeneous firms. When extensive growth determinants are considered, domestic competition is found to have the most pronounced differential impact across all of the observed subsamples of the TFP distribution.

Table 4 Tests for the equality of regression coefficients across TFP distribution quartiles

(df) χ^2 (p)	lnEmpl			lnTFP		
	1st vs. 2nd and 3rd quartile	1st vs. 4th quartile	2nd and 3rd vs. 4th quartile	1st vs. 2nd and 3rd quartile	1st vs. 4th quartile	2nd and 3rd vs. 4th quartile
lnEmpl(-1)				(2) 6.32 (0.042)	(2) 30.88 (0.000)	(2) 34.61 (0.000)
lnEmpl ² (-1)				(2) 5.18 (0.075)	(2) 17.05 (0.001)	(2) 36.47 (0.000)
lnTFP(-1)	(2) 3.58 (0.167)	(2) 19.98 (0.000)	(2) 6.38 (0.041)			
lnKint(-1)	(2) 2.51 (0.286)	(2) 12.80 (0.002)	(2) 4.34 (0.114)	(2) 4.26 (0.119)	(2) 20.40 (0.000)	(2) 57.43 (0.000)
lnWage(-1)	(2) 7.69 (0.021)	(2) 20.79 (0.000)	(2) 5.54 (0.063)			
lnAge	(2) 9.16 (0.010)	(2) 29.07 (0.000)	(2) 4.24 (0.120)	(2) 6.58 (0.033)	(2) 31.28 (0.000)	(2) 34.14 (0.000)
IndMarkup(-1)	(2) 8.63 (0.013)	(2) 14.52 (0.001)	(2) 6.84 (0.033)	(2) 6.27 (0.044)	(2) 42.50 (0.000)	(2) 38.70 (0.000)
fdi(-1)	(2) 3.43 (0.180)	(2) 28.21 (0.000)	(2) 7.46 (0.024)	(2) 7.48 (0.024)	(2) 16.46 (0.001)	(2) 36.70 (0.000)
EXor(-1)	(2) 3.24 (0.198)	(2) 14.98 (0.001)	(2) 5.17 (0.076)	(2) 2.29 (0.318)	(2) 18.28 (0.000)	(2) 34.14 (0.000)
hFDI(-1)	(2) 2.58 (0.276)	(2) 11.52 (0.003)	(2) 5.99 (0.050)	(2) 6.44 (0.040)	(2) 14.23 (0.001)	(2) 36.08 (0.000)
IMint(-1)	(2) 6.73 (0.035)	(2) 11.61 (0.003)	(2) 4.32 (0.116)	(2) 18.63 (0.000)	(2) 23.47 (0.000)	(2) 34.26 (0.000)
Joint test	(10) 18.14 (0.053)	(10) 62.41 (0.000)	(10) 22.47 (0.013)	(10) 2801.29 (0.000)	(10) 720.53 (0.000)	(10) 2010.90 (0.000)

According to the estimates of the intensive growth model shown in Table 2, firm size, measured by the number of employees, non-monotonically impacts productivity growth, indicating that TFP growth rates increase with a firm's size when firms are small, but productivity growth eventually levels off and decreases with size. This shows that the ability to innovate is related to economies of scale and that size is an important factor allowing firms to develop specific competencies that are critical for

productivity growth. However, the results across quartiles (Table 3) suggest that when one reaches the group of the most productive firms size no longer brings advantages in terms of TFP growth. Similar to other studies (e.g. Oliveira and Fortunato, 2006 and Bigsten and Gebreeyesus, 2007), our results based on the whole sample (Table 2) reveal that on average employment grows faster in more productive firms and in younger firms. The evidence of a negative impact of a firm's age on its extensive growth presented in Table 2 is in line with Jovanovic's (1982) theoretical prediction which is confirmed for all but the least productive firms, i.e. firms from Quartile 1 as shown in Table 3. While age is an important factor of the extensive growth of manufacturing firms from our dataset, our results show no evidence of a significant impact of age on the firms' productivity growth in the aggregate sample or in any quartile-based subsample. It suggests that the learning process, based on business experience, which is accumulated over a firm's life and is not captured in other explanatory variables (in particular size and TFP), has played a relatively more important role in the intensive than the extensive aspect of firm growth.

The theoretically hypothesised relationship between firm growth and its capital intensity is confirmed in all specifications of the intensive and extensive growth aggregate models. Our results support the argument that more capital-intensive firms grow faster in both terms, which is in line with Olley and Pakes (1996). Yet the quartile results from Table 3 indicate that capital intensity is important for TFP growth only for the least productive firms, while the TFP growth of more productive firms seems not to rely on the capital intensity of production any more.

Contrary to our expectations, the impact of a firm's average wage as a proxy for a firm's skill intensity on the firm's employment growth is not significant in the aggregate model. Yet, the skill structure of labour seems to be important for the employment growth of firms on the edges of the TFP distribution, i.e. the least and most productive firms but it turns out not to be a significant growth determinant for firms from medium quartiles of the TFP distribution. Such results suggest that skill structure is an important growth factor for firms with the highest productivity, which mostly operate in high-tech industries, and for the least productive firms struggling for their survival.

The aggregate results presented in Table 2 indicate that foreign firms do not grow differently from domestic ones, with all else being equal in terms of either employment or TFP since the coefficient on the fdi_{ijt} dummy variable is not statistically significant. However, as indicated in Table 3, the least productive foreign firms seem to grow significantly faster in terms of employment but surprisingly slower in terms of TFP. The higher employment growth of foreign firms within the first quartile of the TFP distribution might be a result of softer budget constraints of foreign subsidiaries compared to domestic, least productive (and possibly the smallest) firms. The negative impact of foreign ownership on TFP growth for this subsample of firms is possibly linked with additional costs borne by infant foreign firms associated with the establishing of cross-border operations. These results contradict the findings of Damijan et al. (2003) who report a positive effect of foreign ownership on TFP growth for Slovenian manufacturing, although it is noted that their results were obtained from a sample of around 1,000 larger firms in the 1994–1999 period.

We also find that more export-oriented firms tend to grow faster in employment terms as was expected based on the theoretical considerations. The results across quartiles (Table 3) further suggest that this is the case for all quartiles of the TFP distribution except for the least productive firms. Evidently exporting does not contribute to the extensive growth of the least productive firms which might suggest that the prevailing reason for these firms becoming exporters is likely a defensive reaction to their competitive position in the domestic market. But at the same time no evidence of exporters' higher TFP growth is found in either the aggregate sample or in any of the quartile subsamples. Such results are in contrast to the learning-by-exporting hypothesis which suggests that knowledge flows

from international buyers and competitors help to improve the post-entry performance of export starters. Similarly, Damijan and Kostevc (2006) failed to find conclusive evidence of learning-by-exporting for Slovenian manufacturing firms, suggesting that perceived learning effects may in fact only be a consequence of the increased capacity utilisation brought about by the opening of an additional market. Also in a wider context, a survey of empirical studies on the topic (Wagner, 2007) shows that although exporters are more productive than non-exporters, and more productive firms self-select into export markets, exporting does not necessarily improve productivity.

The impact of the industry-level markup size is negative in all aggregate growth model specifications but significant only in the case of intensive firm growth for the least- and medium-productive firms. The higher the industry-level markup size, i.e. a lower degree of competition, the lower is the TFP growth. This result supports our expectations that competitive pressure forces firms into productivity growth. One exception is the group of the most productive firms where firms' TFP growth seems to be independent of domestic competition. As suggested by the reported descriptive statistics (Table 1), these firms typically operate in globally integrated industries and are thus less sensitive to domestic industry conditions.

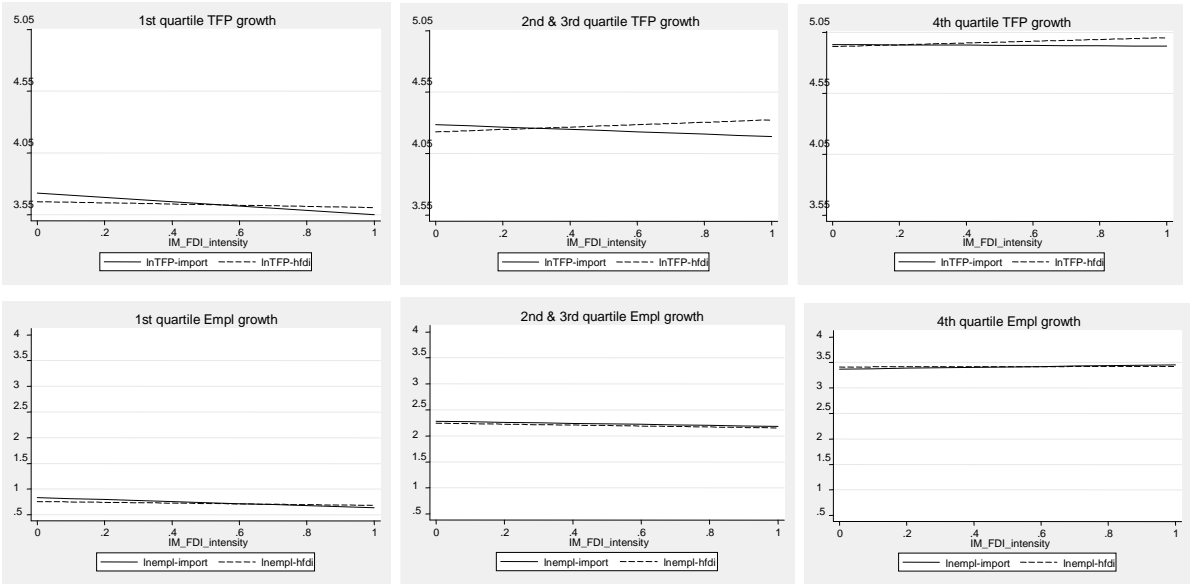
In the aggregate model (Table 2) the impact of inward FDI measured by foreign firms' share in industry employment (*hFDI*) is found to be significant only for TFP growth of local firms, but not for their employment growth. This suggests that inward FDI is more directly linked to intensive than extensive local firm growth. The impact of foreign firms' presence (*hFDI*) on TFP growth is positive, indicating that positive externalities more than offset any negative effect associated with competition pressure from foreign firm entry via FDI within a particular industry. The results across quantiles (Table 3) further show that the productivity spillover effects only appear for firms within the second, third and fourth quartiles of the TFP distribution. The empirical evidence of the differential effect stemming from foreign presence is supported by Fotopoulos and Louri (2004), although they report less significant productivity spillovers at both tails of the conditional distribution. Such a heterogeneous effect also confirms the importance of the absorptive capacity of local firms in order to be able to benefit from the presence of foreign firms. As mentioned above, the aggregate impact of the concentration of foreign firms within industry has an insignificant impact on employment growth. The regression across quartiles supports the theoretical expectation that the impact of foreign firms' presence induces a reallocation among firms with different levels of TFP. Namely, the impact of intra-industry foreign firm concentration is negative for firms from the lowest and medium parts of the TFP distribution, which provides evidence of a crowding-out effect. However, the business-stealing effect is not statistically significant for the first quartile subsample. The insignificant effect might be a result of the relatively higher upward bias in growth estimates for this subsample due to the relatively high firm exit rate of the least efficient firms. Namely, for Slovenian manufacturing firms Zajc Kejžar (2011) found that the survival probability of incumbent firms is decreased upon foreign firm entry via FDI. For the subsample of 25 percent of the most productive firms the impact of intra-industry foreign firm concentration is insignificant. Since TFP is included among explanatory variables, taking up any possible productivity spillover effects, such an insignificant coefficient indicates the absence of a significant competition effect for the most productive firms.

Regarding import intensity, we find a significantly negative impact on both employment and TFP growth in the aggregate model, suggesting that local firms experienced a significant competition effect from imported goods. Not surprisingly, the quartile of the most productive firms stands out from these aggregate results. In the quartile of the most productive firms import intensity promotes their employment growth. This result is not in line with recent findings of Dosis and Milgram-Baleix (2009) showing that TFP is negatively impacted by tariffs and positively by the presence of imported goods. Yet it is noted that Dosis and Milgram-Baleix (2009) used a much more aggregated 2-digit

level of industries which also captures imports of intermediates. To test the potential “learning” by importing or benefiting from technical innovation through imports on firm growth, we would need to have available data on firms’ import propensity.

The differential effect of foreign competition variables is illustrated in Figure 2 which presents the estimated marginal effects of variation in import intensity and inward FDI on firm employment and TFP growth. The differently sloped lines in Figure 2 on one hand show that growth in terms of employment is evidently less sensitive to exposure to foreign competition across all analysed subsamples compared to TFP growth and that the impact is relatively weak. In addition, the impact of variation in foreign competition intensity is similar regardless of the type of foreign competition, i.e. imports or inward FDI. On the other hand, the magnitude of the effect of the increased intensity of foreign competition on firms’ TFP growth differs across quantiles of the TFP distribution. As evident from Figure 2, increased exposure to foreign competition limits the TFP growth of the least productive firms to the largest extent, where the impact of increased import intensity and inward FDI is negative. For firms from all other parts of the TFP distribution, the influence of import intensity is similar, while the consequence of increased FDI is positive, indicating that productivity spillovers outweigh the competition effect at some point. Contrary to employment growth, Figure 2 reveals that different types of foreign competition affect a firm’s TFP growth in a less uniform manner and that the effect of selection and allocation associated with inward FDI is much more pronounced than with the case of imports.

Figure 2: Marginal effects of changes in import intensity and inward FDI on TFP growth and employment across the analysed subsamples



The above results provide us with additional insights for policymaking since industrial and trade policy have the ability to influence the degree of foreign competition. Our results namely show that, in terms of employment, the consequences of industrial or trade policy measures promoting foreign competition would be relatively uniform across firms regardless of a firm’s relative TFP performance. At the same time, the TFP growth of firms with a different position in the TFP distribution adjusts significantly differently to changes in the degree of foreign competition. Thus industrial and trade policy measures are expected to produce different outcomes of TFP growth rates between firms from different quantiles of the TFP distribution. Our results therefore confirm that the reallocation effect has to be considered in policymaking when defining a policy action’s targets.

Given the greater scope of efficiency externalities and stronger reallocation effects in the case foreign firms entering via FDI compared to the trade entry mode, policy actions aiming to attract inward FDI are expected to have a larger positive impact on the aggregate productivity level and a more encouraging/less discouraging impact on employment compared to already established benefits associated with removing barriers to imports.

5. CONCLUDING REMARKS

The paper tests for different determinants of firm growth and highlights the differences between the factors of intensive and extensive firm growth based on a dataset that covers the whole population of manufacturing firms registered in Slovenia in the 1994–2003 period. To address the importance of firm heterogeneity for growth-related issues, the paper also focuses on the differences in growth determinants between different subsamples of firms belonging to different parts of the TFP distribution. Special attention is paid to the role of foreign competition in firm TFP and employment growth.

We provide evidence of the relatively large variability of intensive and extensive growth determinants across firms from different TFP distribution quartiles in the array, magnitude or even direction of their impact. We find large variability in the impact of foreign competition on the growth of firms from different parts of the TFP distribution, which confirms the predictions of theoretical models about the potentially strong reallocation and selection effects of foreign competition among heterogeneous firms. However, the employment growth of firms is found to be less sensitive to exposure to foreign competition across all quartiles of the TFP distribution compared to TFP growth. In addition, the magnitude of the effect of the increased intensity of foreign competition on the TFP growth of firms differs across quartiles of the TFP distribution and is most repressive in the quartile of the least productive firms. More specifically, inward FDI measured by foreign firms' share in industry employment has a significant positive effect on the TFP growth of firms from the second, third and fourth quartiles of the TFP distribution. On the contrary, the intra-industry concentration of foreign firms decreases the employment growth of firms from the lowest and medium parts of the TFP distribution. The likelihood that the positive productivity spillover effect outweighs the negative competition effect associated with inward FDI thus increases with a firm's TFP. This finding confirms the theoretically predicted selection effect of increased foreign competition where the growth of surviving firms is reduced more among the less efficient incumbent firms. Our results also confirm the competition effect of imports, except for firms from the upper tail of the TFP distribution.

Our results thus confirm that the reallocation effect has to be considered in policymaking when defining policy measures. While in employment terms the impact of policy measures aimed at increased openness of the economy would be relatively uniform regardless of a firm's relative TFP performance, they are expected to produce different outcomes for TFP growth rates between firms from different quartiles of the TFP distribution. Namely, TFP firm growth changes significantly differently when firms with a different position in the TFP distribution are considered. The results show the greater scope of efficiency externalities and stronger reallocation effects in the case of foreign firms entering via FDI compared to the trade entry mode and thus suggest that policy actions aiming to attract inward FDI might have an even larger impact on the aggregate productivity level and a more encouraging/less discouraging impact on employment compared to already established benefits associated with removing barriers to imports.

Despite the empirically confirmed relevance of considering firm heterogeneity, the overall empirical evidence demonstrates that for open economies external factors are very important for productivity growth regardless of a firm's relative position in the productivity distribution. Among these external factors, competition pressure from foreign firm operations seems to carry more weight for firm growth compared to the firms' ability to learn through their exporting activity or from their eventual foreign owner.

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Appendix 1: Kernel density plots of the TFP distribution and associated Gaussian distribution for manufacturing industries at the 2-digit NACE Rev. 1 level

