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Creative Destruction and Policy Reforms

Changing Productivity Effects of Firm Turnover in Moroccan Manufacturing

Mary Hallward-Driemeier
Fraser Thompson

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Abstract

How important is firm turnover to national productivity growth? The literature points to the contribution of creative destruction being strongest in more developed countries or where market institutions are strongest. This paper looks at the case of Morocco, spanning 16 years, during which reform initiatives aiming to strengthen market forces were introduced. The paper argues that it is important to take into account i) the timing of how decompositions are structured (capturing the effects of high growth among young firms as part of the benefit of increased entry) and ii) the additional indirect impacts of firm dynamics on agglomeration externalities and competition. The paper shows there are striking differences in the productivity paths of entering and exiting firms compared with incumbents, and that restricting the time horizon of productivity decompositions to the actual year of entry or exit underestimates the productivity effects of turnover. Although it has been hypothesized that conducting decompositions over longer horizons would increase the positive contribution of net turnover, this is not the case in Morocco as losses from exiting firms rise too. Nor has the net contribution of turnover increased with market reforms; if anything, the contribution has declined over time. But the allocation of resources has improved. Both technical and allocative efficiency have risen since the mid-1990s. The paper also shows that firm turnover affects productivity through additional channels. It is closely correlated with measures of agglomeration that are associated with higher rates of exit among unproductive firms, and turnover itself is positively associated with subsequent productivity growth of incumbents.

This paper—a product of the Macroeconomics and Growth Team, Development Research Group—is part of a larger effort in the department to explore firm dynamics and the microeconomics of growth. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at mhallward@worldbank.org.

Creative Destruction and Policy Reforms: Changing Productivity Effects of Firm Turnover in Moroccan Manufacturing

Mary Hallward-Driemeier and Fraser Thompson*

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* Mary Hallward-Driemeier is from the World Bank; Fraser Thompson from Oxford University Centre for the Study of African Economies and McKinsey. The corresponding author is Mary Hallward-Driemeier (mhallward@worldbank.org). We thank Sergio Kurlat for his excellent assistance and helpful comments from Taye Mengistae and Luis Serven. All opinions expressed in the paper are only those of the authors, and the other usual caveats apply.

1. Introduction

This paper examines the contribution of firm dynamics to overall productivity growth. It tests whether firm turnover is a prime driver of productivity growth through the shedding of unproductive firms and the entry of more productive firms, and whether turnover has additional indirect benefits through agglomeration externalities or through increasing the contestability of markets.[1] Of interest too is to look at whether there are trends in these relationships, particularly in the wake of policy reforms. We analyze the case of Morocco, using census data from 1985-2003. Trade liberalization efforts were begun in the 1980s, and a wave of privatization reforms followed in 1994. While barriers to entry remain, over time market institutions have improved. The patterns of technical efficiency (within firms) and allocative efficiency (between firms) do show rising trends over time. The direct contribution of turnover, on the other hand, appears to be muted. However, looking at indirect effects through increased contestability of markets and agglomeration spillovers indicates that turnover does contribute to aggregate productivity increases.

The empirical evidence on the contribution of firm turnover to aggregate productivity displays significant variation, partly attributable to the use of different methods – and to different countries. Baily, Hulten and Campbell (1992) for example examine the evolution of industrial productivity in the United States over the period 1963-87 and find that firm turnover provides a modest contribution to industry productivity growth. Similar evidence of a limited turnover effect on productivity growth

[1] The subsequent task of exploring the drivers of firm turnover is undertaken in a companion paper (Hallward-Driemeier and Thompson 2009).

has been found by Griliches and Regev (1995) in Israel, Liu and Tybout (1996) in Chile and Colombia, and Fukao and Kwon (2004) in Japan. In contrast, others like Hahn (2000), Aw, Chen and Roberts (2001), Foster, Haltiwanger and Krizan (2002), Disney, Haskel and Heden (2003), Gebreeyesus (2005) and Ahn, Fukao and Kwon (2005) find firm turnover to have an important influence on changes in national productivity. Bartlesman, Haltiwanger and Scarpetta (2004) find the effects to be strongest for more developed countries, with the effect varying more for less developed countries. Hallward-Driemeier (2007) also finds that that the strength of market institutions is important in determining the contribution of firm turnover to aggregate productivity.

In applying the standard productivity decompositions used in much of the existing literature to measure firm turnover's contribution, there are two issues. First, there is a concern that a *timing bias* could underestimate the contribution of net entry. As noted by Tybout (2000), the fact that new entrants generally experience a positive (and often steep) trajectory in their productivity levels while exiting firms experience a downward "shadow of death" trajectory in their productivity, suggests that too short-term a measure may understate the overall importance of firm turnover to industry performance. We show that the productivity paths of exiters and entrants are indeed quite steep. Taking them into account does affect the productivity decompositions. However, it does not have the effect of increasing the contribution of net entry (Bartelsman et al. 2004). Or rather, the effects of net entry are somewhat larger, but the trend is no more positive than restricting the contribution of net entry to the single year of entry.

Using a three-year window does smooth some of the fluctuations that hide longer-run trends, demonstrating the differences in the 'technical efficiency' and 'allocative

efficiency' terms pre and post 1994 when the privatization reforms were launched in Morocco.

A second issue concerns the lack of inclusion of indirect effects of turnover. While firm turnover may have a direct effect on national efficiency through the changing productivity composition of firms in a given industry, it can also have an important indirect effect on productivity through its effects on local industry characteristics or agglomeration externalities. These agglomeration externalities refer loosely to the benefits that firms extract from the local industrial structure, usually thought of in three dimensions – specialization, diversity and competition. For example, if firm turnover results in increasing competition in a local area, this could in turn affect the productivity of all firms in that region. As such, we term it a spillover effect of firm turnover. We are unaware of any papers in the existing literature that have explored such spillover effects of firm turnover.[2]

Briefly summarizing our findings, using various productivity decomposition techniques and productivity measures, firm turnover is found to contribute positively to overall performance in many industries. But the effect is not universally present, and the effects are often smaller than the within and between effects of adjustment among incumbents. However, firm turnover is found to have important effects on productivity through its influence on agglomeration externalities. In particular, by improving levels of local competition, firm turnover appears to provide an important boost to local productivity levels.

[2] Disney et al. (2003) analyze the impact of competition (assumed to stem from firm turnover) on productivity growth, but do not consider agglomeration externalities.

The structure of the paper is as follows. Details of the variables included in the analysis and a discussion of the dataset is provided in Section 2. The importance of firm turnover to short-run industry performance is explored in Section 3. Sections 4 and 5 explore the influence of the timing and spillover biases respectively. Finally, we conclude in Section 6 with a summary of the findings and their policy implications.

2. Data and Variable Construction

2.1 The dataset

The dataset used in this analysis is a census of manufacturers conducted annually by the Moroccan Ministry of Industry, Commerce and Productivity (formerly the Ministry of Industry and Telecommunications) from 1985-2003.[3] The survey has almost universal coverage of manufacturing firms across all sectors and areas of the country, with approximately 90% of firms responding.[4] The high response rate can be attributed to the rigorous manner in which the survey is conducted. Each year, firms are sent (via post) a questionnaire to complete. Firms failing to complete this questionnaire are then visited by officials from the Ministry of Industry, Commerce and Productivity (MICP) in order to conduct a face-to-face interview. Haddad, de Melo and Horton (1996) and Fafchamps (2004) have used components of this dataset to analyse the determinants of firm turnover.

The manufacturing firm survey covers a range of basic information on these firms such as sales, production, exports, investment, number of permanent and temporary workers, sector, year of establishment, legal status and location.

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[3] Fraser Thompson thanks Marcel Fafchamps for making the data available for his dissertation and related work.

[4] Only very small or informal firms are not captured by the sample. The coverage of medium and large enterprises is virtually universal. The Ministry of Industry, Commerce and Productivity imputes values for all non-responding firms, usually based on the previous year's information. The regression analysis that follows is restricted to the non-imputed observations, however the productivity decompositions require all observations to be used.

2.2 Context of regulatory reforms in Morocco

One of the reform initiatives championed by the Moroccan government during the period under analysis was its privatization program launched in 1993. Public enterprises had accounted for 20% of GDP and 27% of wages and salaries and accounting for a quarter of value added in industry. By the late 1980s, almost 40% were operating at a loss. From 1988-1991, the loss from the largest 14 state owned companies was equivalent to 1.7% of GDP, rising to 2.1% in 1992, or half the consolidated public sector deficit. Within two years $857 million in sales had been completed. Almost 40% went to foreign investors, a further signal of renewed interest in greater openness and competitiveness. The reform was intended not only to gain revenues and raise the performance of the particular enterprises, but to boost investor confidence more widely and to facilitate development of the private sector. The privatization program was heralded at the time as it represented a shift in approach to the government's involvement in the economy and further support for market based policies (World Bank 1995).

Looking at the data, 1993-94 does represent a shift in the dynamics of firms as discussed below. Within firm adjustments become more efficient after 1994, consistent with greater competitive pressures and market forces pushing firms to improve performance. However, the net entry of firms and job creation also become more volatile, with relatively more adjustment occurring through exiting firms. One of the expected effects, an increase in the contribution of net turnover as market forces strengthened, was not realized.[5] However, there is still evidence that this greater

[5] Two possible explanations include the fact that other policies kept some of the benefits from being realized. For example, macroeconomic policies resulted in real exchange appreciation (22% over the

turnover and churning had indirect effects, increasing the productivity of incumbent firms. Thus, the findings point to the importance of looking not only at the direct effects, but the indirect effects of turnover on overall productivity.

2.3 Productivity estimation

In order to obtain robust productivity estimates, we use two measures of productivity.[6] The first is labour productivity, defined as the log of output per worker. This has been the standard used in the literature due to concerns about possible measurement error in TFP confounding the results. However, we do present a second measure of residual productivity following the approach used by Fafchamps and El Hamine (2004) (see appendix for details) as a robustness check. Both series provide very consistent results.

2.4 Descriptive statistics

Some basic descriptive statistics are provided in Tables 1 (for the entire sample) and 2 (broken down by entering, exiting and surviving firms).[7] From Table 2 it can be seen that exiting firms have approximately half the number of workers and less than a third of the sales of surviving firms, but still have slightly more workers and sales than

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1990s) (particularly against export competing countries) that led to slowdown in export led growth, and continuing red tape and regulatory restrictions in areas such as labor markets hampered firms from expanding employment and responding to changing economic conditions (World Bank 2002). Another possibility is that some of the exits in the data represent the privatization of these formerly public enterprises. To the extent that they were large, they have disproportionate effects on the contribution of exit. In the later years, there were some exits of relatively more productive public enterprises that contribute to the relatively smaller contribution of net entry to productivity growth. However, with only 42 instances of public firms exiting (the data does not include hotels or utilities), this cannot account for the whole story.

[6] These are available for the period 1985-2001 as sector deflators are not currently available for the last two years.

[7] The agglomeration variables will be discussed later in the paper when we consider spillover effects of firm turnover.

new entrants. Focusing on the productivity measures (both labour and TFP), exiting firms appear to be less productive than surviving firms, but are still more productive than new entrants.[8] As noted by Bartelsman and Doms (2000), this is a fairly common finding amongst productivity studies and provides contradictory evidence to the vintage capital model's prediction (e.g. Caballero and Hammour, 1994) that new plants will enter towards the upper echelons of the productivity distribution.

2.5 Firm turnover trends

Figure 1 shows entry and exit rates in Moroccan manufacturing from 1986-2001, along with the real growth rate of the manufacturing sector.[9] The entry rate is defined as the number of plants observed for the first time in year t but not in year t-1, divided by the total number of plants in year t-1. The exit rate is similarly defined, representing the number of plants observed for the last time in year t-1 but not in year t, divided by the total number of plants in year t-1.

There is an annual average exit rate of 5.2% and an entry rate of 9.1% during the sample period. The exit rate is somewhat less than those found in many other developing countries. Harding, Soderbom and Teal (2006) report annual exit rates of approximately

[8] The TFP estimates cover fewer observations than the other variables in Table 4 due to the use of lagged variable information in the capital stock predictive regression in Table 2 which means that TFP estimates for 1985 are unavailable.

[9] Less than 1% of firms in the sample experienced multiple entries during the sample period (i.e. exited and re-entered). In many census datasets, multiple entries can often be driven by sampling error whereby the survey only captures firms over a certain size threshold and firms who dip below this threshold in a given year can be excluded from the survey and falsely believed to have exited. This does not appear to be the case with the Moroccan data however as the census data does not have a size threshold. Further analysis of these multiple-spell firms also showed that these firms do not appear to be particularly small in size (measured both in terms of workers and revenues) prior to exit, which suggests that they do actually experience multiple spells during the sample period and are not falsely omitted from the census. For the analysis here, we restrict our definition of 'exit' to the 'final' exit of a firm in the period and to not include multiple measures of exit for the same firm.

8% in Kenya and Tanzania between 1993/94 and 1998/99 (although Ghanaian firms had an exit rate of just over 3% per annum), and Gebreeyesus (2005) finds annual exit rates of 22% in Ethiopia from 1996-2003. In terms of slightly more dated data, Roberts (1996) finds annual exit rates of 11.1% in Colombia from 1977-85; and Tybout (1996) reports exit rates of 10% in Chile from 1979-85. The entry rate is also fairly low compared to other developing countries. Shiferaw (2009) reports annual entry rates of approximately 20% for Ethiopia from 1996-2002, Roberts (1996) finds entry rates of 12.2% in Colombia from 1977-85, and Tybout (1996) finds entry rates of 6% in Chile from 1979-85, however entry rates were likely lower than normal in this latter study as the sample period covered a major recession.

Interestingly, firm exit and firm entry tend to move in the same direction through time, with rates decreasing until 1994, and then showing an upward trend after this point. This is a somewhat surprising result given that a priori, there are strong reasons to expect them to move in opposite directions (e.g. a recession increases the firm exit rate and decreases the firm entry rate) (Bartelsman et al. 2004).[10] Furthermore, while net entry is positive in every year, the gap between entry and exit rates has narrowed considerably since 1992.[11] Figure 1 also shows that the growth rate of the manufacturing sector has been extremely volatile in the period under examination; however there does not tend to be a clear relationship between economic conditions and firm entry or exit.[12]

[10] One reason the pattern can vary can depend on the extent to which entrepreneurship becomes a means of coping with negative shocks. That the Moroccan data has no minimum cutoff makes it more likely to capture this effect that country datasets that only capture firms with 10 or 20 or more employees.

[11] The increase in exit rates after 1994 may be linked to greater competitive pressures as exposure to international markets expanded and as privatization efforts were undertaken (World Bank Country Assistance Strategy (2001)).

[12] This interpretation is consistent with the findings of Haddad, de Melo and Horton (1996) who found no significant correlation between rates of real output growth and entry and exit rates for Morocco from 1984-89.

Figure 2 looks at job creation and job destruction as opposed to firm entry and exit. It shows that job destruction has increased over time, while job creation has remained fairly flat so that net creation is lower. It should be noted that volatility in job destruction and in excess churning has risen in recent years. The bottom two figures then show the relative contribution of entrants (and exiters) to incumbents for job creation (destruction). Clearly the majority (almost three quarters) of job creation is accounted for by incumbent firms expanding. The share provided by entrants is remarkably stable over time. For job destruction, the adjustment by incumbents again is the dominant source of job loss. However, the share contributed by exiting firms has risen since the mid-1990s. With net firm entry positive and net job creation flat near zero, more – but smaller—firms are entering the market.

3. Productivity Decomposition Analysis

The appropriate technique for decomposing aggregate productivity changes remains unsettled. As shown in Table 1, the extant literature has used a range of productivity decomposition techniques, as well as productivity measures, to explore the composition of aggregate productivity growth. Comparing results across studies cannot give a definitive answer as to the important of turnover on productivity growth, due to differences in countries, sectors and time periods covered, and by differences in the frequency, and methodologies used (Foster et al. (2001). In the interests of robustness, the approach taken by this paper is to consider a range of alternative decomposition

techniques, while using both our measure of TFP and labour productivity.[13] The techniques have in common attempts to divide the contribution between incumbents and entrants and exits, with the contribution of incumbents further divided between adjustments within firms and between firms (and in the case of Foster, Haltiwanger and Krizan, the inclusion of a covariance term too).

4. Choice of Time Periods in Measuring the Contribution of Net Entry

Before turning to the specific decompositions, figures 3a and 3b demonstrate how the timing or length of time period used in the decomposition could matter. As demonstrated across two dozen countries in Bartelsman et al. 2004, surviving new firms have a positive productivity growth trajectory. Figure 3a shows for each cohort the extent of this rise in productivity.[14] The average productivity of continuing plants shows a fairly moderate rate of increase throughout the 1986-2001 period. Each birth cohort begins with a substantial productivity disadvantage relative to continuing plants. However, the birth cohorts generally experience rapid productivity improvements post-entry, consistent with the evidence found by Liu and Tybout (1996), Hahn (2000) and Aw et al. (2001) in other countries. While catch up is not complete, the pace slows after approximately 3 years, consistent with Hahn's (2000) findings for Korean firms, and the 3-4 years found by Liu and Tybout (1996) for Colombian firms. Consistent with this, we conclude three years

[13] We do not consider the Baldwin and Gu (2004) productivity growth methodology in this paper. While potentially interesting, its assumption that entering firms replace exiting firms is clearly untenable in the case of Morocco given the significant gap between entry and exit rates documented earlier. Petrin and Levinsohn (2006) have also developed a new decomposition, but entry and exit are not incorporated, it is not considered here.

[14] The comparison is confined to firms surviving until at least 2001 in order to isolate the productivity evolution of new entrants from the effects of firm exit.

may be an appropriate window for capturing the fuller contribution of entering firms to aggregate productivity.

On the other hand, exiting firms can show evidence of a "shadow of death" effect (Griliches and Regev (1995)), whereby exiting firms exhibit declining productivity growth before actually exiting. Indeed, Figure 3b shows that firms that ultimately exited already showed signs of relative and absolute inefficiency compared to continuing firms, with the gap growing prior to exit. What is striking is the evidence of such gaps in productivity already in evidence even a decade before subsequent exit. [15] As noted by Hahn (2000), this suggests that firm exit reflects underlying productivity differences that have existed over an extended period as opposed to being the outcome of a random negative shock.

Another way to look at the issue is through transition matrices of individual firms in the overall productivity distribution of firms in their sector from 1986-2001.[16] Firms are classified into quintiles of the TFP distribution for their respective sectors in 1986 and 2001.[17] This enables us to examine where the establishments in 1986 end up in the productivity distribution, and similarly the origin of establishments in the 2001 productivity distribution. The transition matrices are reported in Tables 3a and 3b.[18]

The top table shows how firms in 1986 progress by 2001. The rows add up to 100%. The top row shows of firms in the bottom quintile in 1986, 10% remained so in

[15] In contrast to Hahn (2000), we find that productivity levels of exiting firms generally decrease both in relative and absolute terms.
[16] TFP is used as the measure of productivity in this and the subsequent analysis. Using labour productivity in place of TFP produced similar results and hence these results are not included in the paper, but are available from the authors upon request.
[17] Quintile 1 is the lowest productivity group and Quintile 5 is the highest productivity group.
[18] Past papers have often used weighted transition matrices (e.g. Baily et al., 1992; Hahn, 2000; Foster et al., 2002), however we prefer an unweighted transition matrix as we are interested in the productivity movements of the average firm.

2001, while only 4% were able to rise to the top quintile. In contrast, fully two-thirds had exited. For the top quintile, 28% were able to remain in the top quintile, with only 2% falling to the bottom quintile, and 44% exiting.[19] The bottom panel divides firms by the quintile there are in in 2001 and sees where they came from, with the columns now adding to 100%.

Table 3a shows a large role for firm turnover in the productivity distribution, similar to Foster et al. (2002) who used U.S. retail firm data. For any quintile in 1986, the most likely outcome (row percentage) is death. For any quintile in 2001, the most likely origin is birth (column percentage). Like Foster et al. (2002), we find that deaths are concentrated in businesses with low productivity in 1986.[20] In contrast to Foster et al. (2002) who found births to be uniformly distributed, new entrants in Morocco tend to be more likely to be located in lower productivity quintiles, although the results are not as strong as for deaths. Regardless of this, the fact that approximately two-thirds of firms in the highest productivity quintile in 2001 come from new entrants suggests that many new firms rapidly improve their productivity levels post-entry.

The productivity trajectories and transition matrices strongly suggest that while our descriptive analysis shows that new entrants initially have much lower productivity than other firms upon entry, many of these firms experience substantial productivity improvements. As Tybout (2000) has described, disaggregating time intervals in constructing a productivity decomposition too finely is likely to underestimate the true

[19] Baily et al. (1992) find evidence of a systematic plant vintage effect in their data whereby older plants move down the productivity distribution over time. There is some limited evidence of this plant vintage effect in the Moroccan data given the high percentage of firm exits from the 1986 cohort in addition to a general downwards movement of surviving firms in the productivity distribution.

[20] The impact of productivity of firm exit is examined more rigorously in a companion paper, Hallward-Driemeier and Thompson (2009).

importance of firm turnover to the productivity process. As a result, we present the decompositions using a rolling 3 year window. A comparison with a one year interval is discussed below.

4.1 The Baily, Hulten and Campbell (1992) method

The first productivity decomposition method we consider is that of Baily, Hulten and Campbell (1992), aka BHC:

$$\Delta p_{st} = \sum_{i \in C} \theta_{is,t-1} \Delta p_{it} + \sum_{i \in C} \Delta \theta_{ist} \, p_{it} + \sum_{i \in N} \theta_{ist} \, p_{it} - \sum_{i \in X} \theta_{is,t-1} \, p_{i,t-1} \qquad (1)$$

Where p refers to productivity; θ refers to a firm's share of total sector output (thought of in terms of revenues); and the subscripts t, s, i, C, N, and X refer to time, sector, firm, continuing (surviving) firms, new entrants and exiting firms respectively. The first term on the right hand side (RHS) of equation (1) refers to the *within effect*. This represents internal restructuring effects stemming from changes in productivity of surviving firms. The three remaining terms refer to so-called external restructuring effects. The second term on the RHS of equation (1) is referred to as the *between effect* and shows the contribution of changes in the market shares of surviving firms weighted by their final period productivity (i.e. period t). The third and fourth terms on the RHS of (1) together show the contributions of firm turnover to changes in aggregate sector productivity. The third term reflects the contribution to sector productivity growth of newly entered firms (weighted by their market share upon entry) and the fourth term shows the contribution of exiting firms (weighted by their market share in the previous period when they were still

in operation).[21] In order to calculate aggregate changes in manufacturing productivity, we weight each sector by their share of total manufacturing output.[22]

The BHC productivity decomposition results from 1987-2001 for the manufacturing sector as a whole are shown in Figures 4a (labor productivity) and 4b (TFP) together with real growth rates of the manufacturing sector. The TFP and labour productivity decompositions appear remarkably consistent with each other.[23] The *within effect* is generally negative in both decompositions. This suggests that surviving firms have generally made a small negative contribution to productivity growth, which may be reflective of the impact of various business climate constraints analysed in Mengistae and Thompson (2006). The effect however is trending upward; incumbent firms are improving their technical efficiency over time. The *between effect*, which provides a measure of allocative efficiency is negative in the first half of the sample, then generally positive after 1994. This suggests that market share reallocation of less productive firms to more productive firms is one of the key mechanisms underlying aggregate productivity changes in Moroccan manufacturing. Focusing on firm turnover, we see that net entry actually falls during the period, with its contribution largest (and positive) prior to 1994.

The past literature has found that the importance of the various productivity components varies significantly throughout the business cycle. Baily et al. (1992) for example, find a cyclical pattern to the role of net entry in driving productivity growth in the United States. More specifically, they find that firm turnover has a positive impact on

[21] In all of the productivity decompositions in this section, the entry and exit terms are combined into a net entry component to facilitate interpretation.
[22] The same sector weights are used in both the TFP and labor productivity regressions to ensure that any differences between these alternative techniques are driven by the productivity measure and not the weighting procedure employed.
[23] Previous studies for OECD countries have found the *within* effect to be comparatively stronger using labour productivity and the net entry effect to be stronger using TFP data (OECD, 2001).

productivity growth only during recessionary periods, while it tends to have a negative effect on productivity growth during economic expansionary periods. Hahn (2000) also finds that net entry accounts for a greater proportion of aggregate productivity growth during economic contractions. In terms of the other components of productivity growth, Baily et al. (1992) and Hahn (2000) find that the *within effect* tends to be larger during cyclical upturns. To investigate the sensitivity of our decomposition results to the business cycle, we include real growth rate data for the manufacturing sector over the period of analysis. Consistent with these previous studies, the *within effect* appears to vary pro-cyclically (the effect is considerably stronger using annual decompositions given the short duration of the economic fluctations.). In contrast, there is little evidence of cyclical variation in the between-firm component, and weak pro-cyclical effects of net entry. The combination of the pro-cyclical movements of the *within effect* and net entry, net entry does not account for a greater proportion of aggregate productivity growth during economic contractions.

This manufacturing-wide analysis may be obscuring important differences in the drivers of productivity changes between industries. To investigate this possibility, in Figure 4c, we present the Baily et al. (2002) TFP decomposition for seven sectors.[24] There are considerable disparities between sectors with the net entry effect being positive in 4, but negative or insignificant in 3. In contrast, the *within effect* appears to have a consistently negative influence across the sectors but food & tobacco.

The findings from the job creation and destruction indicated that there were more entrants than exiters, but that they were smaller, leaving net job creation relatively flat.

[24] The labour productivity decomposition showed consistent results to the TFP decomposition and thus are not included in this paper, but are available from the authors upon request.

This is consistent with the decomposition that these smaller entrants are not that productive initially. Even accounting for a catch-up period, it does not offset the losses in productivity of larger firms that on average are more productive than the initial entrants.

However, Haltiwanger (1997) cautions that this decomposition can bias the findings on turnover by failing to consider the relative productivity of entrants and exiters.[25] Relatively less productive entrants, by sheer greater numbers can offset more productive existers. An alternative productivity decomposition, suggested by Foster, Haltiwanger and Krizan (2001) (FHK) addresses this concern by measuring the productivity of firms relative to average productivity.

4.2 The Foster, Haltiwanger and Krizan (2001) method

Foster et al. (2001) decompose productivity growth as follows:

$$\Delta p_{st} = \sum_{i \in C} \theta_{is,t-1} \Delta p_{it} + \sum_{i \in C} \Delta \theta_{ist} \left(p_{i,t-1} - p_{s,t-1} \right) + \sum_{i \in S} \Delta \theta_{ist} \Delta p_{it} + \sum_{i \in N} \theta_{ist} \left(p_{it} - p_{s,t-1} \right) - \sum_{i \in X} \theta_{is,t-1} \left(p_{i,t-1} - p_{s,t-1} \right) \qquad (2)$$

Where the variable definitions are the same as those used in equation (1). The first term on the RHS of (2) is the same within-survivors effect as in the BHC decomposition. The second term shows the *between effect* for surviving firms. This is positive when the market shares increase for those survivors with above-average productivity in the previous period (i.e. t-1). The third term is an additional covariance term that is positive when market share increases (falls) for establishments with growing (falling) productivity. The BHC decomposition combines these two terms together by calculating

[25] Petrin and Levinsohn (2006) show that the Baily et al. (1992) productivity decomposition technique is also potentially unsuitable for the analysis of welfare effects stemming from these firm dynamics.

the *between effect* as the sum of changes in market share weighted by ending period productivity (i.e. period t). The final two terms on the RHS of (2) represent the contributions of firm entry and exit respectively. These will be positive when there is entry (exit) of above (below) average productivity firms.

As observed by Foster et al. (2001), the key advantage of this method in comparison to the BHC decomposition technique is its simpler interpretation: only new entrants with above average productivity will produce a positive contribution to aggregate productivity growth. The FHK productivity decomposition results from 1987-2001 for the manufacturing sector as a whole are shown in Figures 5a (labor productivity) and 5b (TFP).

Once again the TFP and labour productivity decomposition results show very similar patterns. One of the most obvious differences from the earlier BHC decomposition results is the reduced positive productivity growth contribution of net entry, due to the adjustment for relative productivity levels of entering and exiting firms.[26] Indeed, even the prior positive contribution in the earlier years is reduced.

The other striking result is the positive and large effect from the covariance term, suggesting that Moroccan firms with rising productivity also experience gains in market share in their respective sectors. The *between effect* is more negative, but still rising.[27] The positive sizeable effect for the covariance term is consistent with the findings of Haltiwanger (1997) and Foster et al. (2001) but in contrast to Foster et al. (2002), who finds a negative effect, and Disney et al. (2001) and Bartelsman et al. (2004) who find the

[26] In particular, the FHK decomposition has removed some of the productivity bias stemming from the large number of new entrants with below average productivity.
[27] The *within effect* is formulated exactly as under the BHC decomposition and thus is unchanged from this earlier analysis.

covariance effects to be positive but small. In terms of the cyclical variation of the productivity components, consistent with Foster et al. (2001) and the earlier analysis for the BHC decomposition, the *within effect* tends to vary pro-cyclically and the net entry component accounts for a greater proportion of productivity growth during economic contractions.

The TFP decomposition results by sector are shown in Figure 5c. The positive covariance term is positive for all the sectors, with the between effect negative and net turnover quite small.

4.3 The Griliches and Regev (1995) method

While the FHK decomposition technique may have a clearer interpretation than the BHC methodology, it has been highlighted in several papers in the recent literature (e.g. Disney et al., 2003; Baldwin and Gu, 2004) that this method, and the BHC method, are particularly prone to measurement error. Take the example of our current approach where we are using output weights with TFP. If there is any random measurement error in output (which does not seem unlikely), then there will be a positive covariance between productivity changes and changes in market shares, and hence an overestimation of the covariance term.[28] The lack of a strong positive association of net entry makes this seem less significant as a potential concern, but we show this through the inclusion of the Griliches-Regev decomposition.

Griliches and Regev (1995) develop an alternative productivity growth decomposition technique that is less sensitive to such measurement errors. In this paper,

[28] Related to this point, Baldwin and Gu (2004) also describe how the FHK and BHC decomposition methods can suffer from bias related to transitory effects, especially in annual data as used here.

we use a variant of their technique used in papers such as Foster et al. (2001) and Disney et al. (2003):

$$\Delta p_{st} = \sum_{i \in C} \bar{\theta}_{is} \Delta p_{ist} + \sum_{i \in C} \left(\bar{p}_i - \bar{P}_s \right) \Delta \theta_{ist} + \sum_{i \in N} \theta_{ist} \left(p_{it} - \bar{P}_s \right) - \sum_{i \in X} \theta_{is,t-1} \left(p_{it-1} - \bar{P}_s \right) \quad (3)$$

Where the variables are the same as those used in equations (1) and (2). The key difference of this methodology compared to equation (2) is that the output weights are averaged over periods t-1 and t, which serves to mitigate any bias induced by random measurement error in output. The disadvantage of this method is that its formulation means that it is impossible to separate the *within* and *between* effects completely from the covariance effects, making the interpretation of different terms less clear cut.

The GR productivity decomposition results from 1987-2001 for the manufacturing sector as a whole are shown in Figures 6a (labor productivity) and 6b (TFP). The labour productivity results are again consistent with the TFP decomposition. The main differences between the GR decomposition and the previous two techniques are that the *within effect* appears slightly more positive, and the *between effect* is slightly more positive again in the later years. This likely reflects the fact that the positive covariance effect is in part being captured by the *within effect* under this decomposition technique. Net entry is largely unchanged from the FHK decomposition. The sectoral TFP decomposition is shown in Figure 6c. Consistent with Baily, Bartelsman and Haltiwanger (2001), we also find that the *within component* varies pro-cyclically during the sample period. However in contrast to this earlier paper, there is no evidence of the between-firm component displaying counter-cyclical variation. If anything, the evidence for Morocco suggests a weak pro-cyclical effect.

Having argued that allowing the initial growth burst to be included in the net entry windows, Figure 7d shows how the results differ using annual frequencies. First, it is not the case that the relative contribution of firm turnover is higher with the longer window. Particularly as there are some larger productive firms that exit, expanding the window for exit to 3 years offsets the gains to the new entrants. Second, the annual frequency has more volatility, masking any trends in the data.

In the next section, we explore another potential channel by which firm turnover can affect aggregate productivity, through so-called spillover effects.

5 Spillover Effects of Firm Turnover

The analysis to this point has focused on the direct effects of firm turnover on aggregate productivity through its influence on the productivity composition of firms in a given industry. Firm turnover can also have potentially important indirect effects on firm productivity, which to our knowledge have yet to be given proper attention in the literature. Firm turnover not only affects the productivity composition of a given industry, it also affects other industry characteristics. For example, firm entry is usually associated with greater levels of competition. These industry characteristics can in turn have important effects on firm performance at the local level, as documented by economists and historians such as Jacobs (1969) and Porter (1990). The effects of the local industrial structure on firm performance are referred to as *agglomeration externalities*. They are usually thought of as consisting of three dimensions – industrial specialization, industrial diversity and competition. If firm turnover influences any of these three components, and these agglomeration externalities are found to be important drivers of firm performance,

then it is possible that we may have been ignoring an important channel by which firm turnover affects aggregate performance levels.

Specialization and diversity effects are captured through the inclusion of three variables: total workers in the location-sector (L_{jst}; where j refers to the sub-national location, s refers to the sector and t refers to the time period); total workers in the entire location $\left(i.e.\ L_{jt} = \sum_{s \in jst} L_{jst} \right)$; and a diversity index based on regional employment shares of all sectors;

$$D_{it} = \frac{1}{\sum_{s \in jst} \left(\frac{L_{jst}}{L_{jt}} \right)^2} \qquad (4)$$

The first competition variable is a Hirschman-Herfindahl Index (HHI) which is constructed as follows:

$$C^1_{jst} = \frac{1}{\sum_{i \in jst} \left(\frac{Q_{it}}{Q_{jst}} \right)^2} \qquad (5)$$

where Q represents price-deflated output. This competition index variable is formulated such that higher values of the variable reflect higher levels of competition in that particular location-sector. The HHI is affected by both the number of firms in the location-sector as well as the inequality in firm market shares. If all firms are the same size, then the HHI is simply equal to the number of firms in the location-sector. Thus we also include the number of firms (I) in the location-sector to determine the influence of the omitted variable (i.e. variance of firm market shares):

$$C^2_{jst} = I_{jst} \qquad (6)$$

where I_{jst} is the number of firms in a location-sector for a given time period.

Location is measured at the province level. The census data divides the country into 70 provinces. Tables 1 and 2 provide some descriptive statistics for these agglomeration variables. From Table 1 it can be seen that the average firm is located in a province-sector with an average of 212 competitors and 17294 workers, representing just over 17% of the total workers in the province. Comparing the values of the agglomeration variables across new entrants, surviving firms and exiting firms in Table 2, it can be seen that new firms tend to locate in province-sectors which are generally smaller and where competition is comparatively weak (as evidenced by the fewer number of firms and the lower level of the Competition HHI).

Determining the effect of firm turnover on the agglomeration variables introduced above presents some practical difficulties. Similar to the productivity decompositions, the agglomeration variables will be affected by within (e.g. a firm experiences a positive sales shock and so raises employment and ceteris paribus, the values of the associated agglomeration variables) and between firm effects (e.g. the production of one firm falls in response to the competition of another firm), in addition to those changes stemming from firm turnover. A question of key importance is how we can isolate the effect of firm turnover on these variables from the other effects mentioned. Establishing a reliable counter-factual for the other effects in these circumstances is difficult. For example, if there was no firm turnover in a given province-sector, what would be the level of production and employment of the existing firms? Given that any method employed to estimate the effect of firm turnover on the agglomeration variables is potentially flawed, we opt for the simplest procedure capable of providing an insight into the effect of firm

turnover. In Figure 8a, we calculate the co-movement of firm turnover and the agglomeration variables relative to the base year (i.e. 1985), as well as changes in firm turnover with changes in agglomeration (Figure 8b). The correlation is extremely high, with exception of the diversity index.

The results show that all of the agglomeration variables, with the exception of the diversity index which shows a steady decline, tend to increase (relative to their 1985 values) until 1993, then show a general decline. The province-sector firms and the province employment variables return to values similar to their 1985 levels, while the competition HHI and the province-sector employment variables remain higher than these initial levels. While it is impossible to be certain that firm turnover is driving these results, the variables are generally consistent with the pattern of net entry shown in Figure 1. In Figure 1, it was shown that the net entry rate generally decreased after 1993, but was still nonetheless positive. Given that in Table 2 entering firms were found to be generally smaller (in terms of revenue and employment) than exiting firms, this reduced net entry rate could explain why the agglomeration variables have decreased post-1993.[29]

The final task is to show the effect of these agglomeration variables on firm productivity levels.[30] Hallward-Driemeier and Thompson (2009) directly test for the contribution of these agglomeration effects on the cleansing potential of creative destruction. Controlling for firm-level fixed effects, time varying firm characteristics, and sector, time and location effects, the rate of firm turnover and the agglomeration

[29] The firms in the province-sector could have been expected to increase given that net entry was still positive post-1993. The reason for its fall during this time period is because exit generally took place from larger province-sectors and entry took place in smaller province-sectors, and so given that the agglomeration variables are taken as a mean value per firm, this difference in weightings explains the fall in the variable.

[30] Productivity levels, as opposed to growth, are used in this analysis to be consistent with the theoretical literature in this area that emphasizes agglomeration externalities operating through level effects.

variables affect the relative productivity of exiting firms and the ability to attract new entrants to a location.

Here we provide two tests of whether turnover affects productivity. The first is shown in Figure 7, where higher rates of turnover are indeed positively associated with higher subsequent productivity growth of incumbents. The figure shows the relationship in sector-year averages.

Table 4 examines the relationship at the firm level. Given the interest in understanding whether the reforms can be seen in the data, we use the standard Chow (1960) test and do identify two sub-periods with stable parameter estimates for the agglomeration variables: 1985-93 and 1994-2001. The competition index variable is the most consistently significant positive effect on firm productivity in both sub-periods, which suggests that the increases in competition from 1986-1993 produced a positive spillover effect. A one standard deviation increase in the number of firms in the province-sector in the 1985-1993 period for example is predicted to lead to a 25% increase in firm productivity. However, the decreases in net entry thereafter have tended to produce a negative spillover effect.

In terms of specialisation and diversity effects, the diversity index is insignificant in the first sub-period and negatively significant in the second. The sector employment variable is also negatively significant in the first and the location employment variable negatively significant in the second sub-period (possibly due to congestion effects).

There is a clear circular relationship between the agglomeration variables and firm turnover, which suggests that the true long-run effects of firm turnover on aggregate productivity may be quite complex. For example, firm turnover can influence the local

industrial structure, which affects firm productivity levels and firm dynamics (Hallward-Driemeier et al. (2009)). These intricate dynamic interactions stemming from firm turnover reinforce the motivation for exploring the long-run effects of net entry.

6 Conclusion

Understanding the contribution of firm entry and exit to changes in aggregate productivity has become of increasing interest to economists as global competition forces greater efficiency demands on economies. The aim of this paper has been to contribute to the existing literature in this area by providing evidence for the Moroccan manufacturing sector.

In looking for the trends in sources of productivity growth, the paper found that allowing for the impact of entry and exit to be captured in a three year window made it easier to distinguish trends and to lower the volatility in the measures. As the rapid growth of surviving young firms and the 'shadow of death' phenomenon are extensive, this makes clearer the role that adjustment among more established incumbents makes to the overall story.

Using the productivity decomposition techniques popular in the literature, the results suggest that net entry has had a small direct effect on aggregate productivity. And the pro-market reforms carried out in the mid-1990s did not lead to an expanded contribution of net turnover. Yet aggregate productivity did rise. Rather, the sources of improvement were found in the adjustment of incumbents, as more productive firms gained larger market shares. And these trends have risen over time.

It is not that turnover is unimportant. Its effects can still be felt indirectly, through expanded contestability of markets and through agglomeration spillovers that themselves feedback to affect future firm turnover and productivity growth.

References

Ahn, S.; Fukao, K. and Kwon, H.U. "The Internationalization and Performance of Korean and Japanese Firms: An Empirical Analysis Based on Micro-Data," RIETI Discussion Paper Series 05-E-008, 2005.

Aw, B-Y.; Chen, X. and Roberts, M. "Firm-Level Evidence on Productivity Differentials, Turnover, and Exports in Taiwanese Manufacturing." *Journal of Development Economics*, 2001, *66*(Oct), pp. 51-86.

Baily, M.; Bartelsman, E. and Haltiwanger, J. "Labour Productivity: Structural Change and Cyclical Dynamics." *The Review of Economics and Statistics*, 2001, *83*(3), pp. 420-33.

Baily, M.; Hulten, C.R. and Campbell, D. "Productivity Dynamics in Manufacturing Establishments." *Brookings Papers on Economic Activity: Microeconomics*, 1992, pp. 187-249.

Baldwin, J. and Gu, W. "Plant Turnover and Productivity Growth in Canadian Manufacturing," Statistics Canada Working Paper, 2004.

Bartelsman, E. and Doms, M. "Understanding Productivity: Lessons from Longitudinal Microdata." *Journal of Economic Literature*, 2000, *38*, pp. 569-94.

Bartelsman, E., Haltiwanger, J. and Scarpetta, S. 2004. "Microeconomic Evidence of Creative Destruction in Industrial and Developing Countries." World Bank Policy Research Working Paper No. 3464.

Basu, S. and Fernald, J. "Aggregate Productivity and Aggregate Technology." *European Economic Review,* 2002 46, pp. 963-91.

Caballero, R. And Hammour. "The Cleansing Effect of Recessions." *American Economic Review*, 1994, 84(5), 1350-1368.

Chow, G.C. "Tests of Equality between Subsets of Coefficients in Two Linear Regression Models." *Econometrica*, 1960, *28*, pp. 591-605.

Disney, R.; Haskel, J. and Heden, Y. "Restructuring and Productivity Growth in Uk Manufacturing." *The Economic Journal*, 2003, *113*, pp. 666-94.

Fafchamps, M. "Manufacturing Growth and Agglomeration Effects," Centre for the Study of African Economies (CSAE) Working Paper, Oxford University, 2004.

Fafchamps, M. and El Hamine, S. "Firm Productivity, Wages, and Agglomeration Externalities," Centre for the Study of African Economies Working Paper, 2004.

Foster, L.; Haltiwanger, J. and Krizan, C.J. "Aggregate Productivity Growth: Lessons from Microeconomic Evidence," C. R. Hulten, E. R. Dean and M. J. Harper, *New Developments in Productivity Analysis.* . Chicago and London: University of Chicago Press, 2001, 303-63.

Fukao, K. and Kwon, H.U. . "Why Did Japan's TFP Growth Slow Down in the Lost Decade? An Empirical Analysis Based on Firm-Level Data of Manufacturing Firms," Paper presented at the 6th Annual CIRJE-TCER Macro Conference, Macroeconomic Analysis of the Lost Decade, December 11-12, 2004, Tokyo, 2004.

Gebreeyesus, M. "Firm Turnover and Productivity Differentials in Ethiopian Manufacturing," Goteborg University Working Paper, 2005.

Griliches, Z. and Regev, H. "Productivity and Firm Turnover in Israeli Industry: 1979-1988." *Journal of Econometrics*, 1995, *65*, pp. 175-203.

Haddad, M.; de Melo, J. and Horton, B. "Morocco, 1984-89: Trade Liberalization, Exports, and Industrial Performance," M. Roberts and J. Tybout, *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity, and Market Structure.* Oxford: Oxford University Press, 1996.

Hahn, C.-H. "Entry, Exit, and Aggregate Productivity Growth: Micro Evidence on Korean Manufacturing," OECD Economics Department Working Paper 2000.

Hallward-Driemeier, M. "Who Survives: The Impact of Corruption, Competition and Property Rights Across Firms." World Bank Working Paper, 2007.

Hallward-Driemeier, M. and Thompson, F. "The Determinants of Firm Turnover in Moroccan Manufacturing," World Bank Working Paper, 2009.

Haltiwanger, J. "Measuring and Analyzing Aggregate Fluctuations: The Importance of Building from Microeconomic Evidence." *Federal Reserve Bank of St. Louis Economic Review*, 1997, *Jan / Feb*.

Harding, A.; Soderbom, M. and Teal, F. "The Determinants of Survival among African Manufacturing Firms." *Economic Development and Cultural Change*, 2006, *54*(3).

Jacobs, J. *The Economy of Cities*. New York: Vintage, 1969.

Little, I.; Mazumdar, D. and Page, J. *Small Manufacturing Enterprises: A Comparative Analysis of India and Other Economies*. Washington: World Bank, 1987.

Liu, L. and Tybout, J. "Productivity Growth in Chile and Columbia: The Role of Entry, Exit and Learning," M. Roberts and J. Tybout, *Industrial Evolution in Developing Countries.* Oxford: Oxford University Press, 1996.

Loayza, N.; Oviedo, A.M. and Serven, L. "Regulation and Microeconomic Dynamics" in *Business Regulation and Macroeconomic Performance*, Loayza, N. And Serven, L. (eds.). Forthcoming, Washington DC: The World Bank.

Mengistae, T. and Thompson, F. "Unbundling Location Effects in Productivity: The Case of Manufacturing Plants in Morocco," World Bank Working Paper, 2006.

OECD. "Productivity and Firm Dynamics: Evidence from Micro Data." *OECD Economic Outlook*, 2001, *69*, pp. 209-24.

Olley, G. and Pakes, A. "The Dynamics of Productivity in the Telecommunications Equipment Industry." *Econometrica*, 1996, *64*(6), pp. 1263–97.

Petrin, A. and Levinsohn, J. "Measuring Aggregate Productivity Growth Using Plant-Level Data," NBER Working Paper, 2006.

Porter, M. *The Competitive Advantage of Nations*. New York: Free Press, 1990.

Roberts, M. "Colombia, 1977-85: Producer Turnover, Margins, and Trade Exposure," M. Roberts and J. Tybout, *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity, and Market Structure.* Oxford: Oxford University Press, 1996.

Shiferaw, A. "Survival of Private Sector Manufacturing Establishments in Africa: The Role of Productivity and Ownership. *World Development*, 2009, 37(3), pp. 572-584.

Tybout, J. "Manufacturing Firms in Developing Countries: How Well Do They Do, and Why?" *Journal of Economic Literature*, 2000, *38*, pp. 11-44.

____ "Chile, 1979-86: Trade Liberalization and Its Aftermath" in M. Roberts and J. Tybout, *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity, and Market Structure.* Oxford: Oxford University Press, 1996.

World Bank. "Country Economic Memorandum for the Kingdome of Morocco." World Bank. 1995.

------ "Country Assistance Strategy for the Kingdom of Morocco," World Bank, 2001

------ "Moroccan Manufacturing Sector at the Turn of the Century: Results of the Firm Analysis and Competitiveness Survey." World Bank. 2002.

Appendix: Estimating Productivity

The dataset includes information on labor (both full time and casual workers) and information on outputs. However, it only includes measures of the capital stock, as deflated net book value of total assets, in 2001. So the first step is to estimate the capital stock using a predictive regression as used in Fafchamps and El Hamine (2004).[31] The results of this predictive regression are shown in Table A1 and explain almost 60% of the variation in capital stocks among firms in the sample. Using the same census dataset, adopted a similar predictive method for obtaining capital stock measures. Alternatively, the capital stock data could have been constructed using investment information and assumptions about depreciation.[32] While such an approach is suitable for relatively short timeframes, the potential for measurement errors to be compounded through time (particularly those stemming from the depreciation assumptions), suggests that the predictive method adopted here is preferable.

The productivity regression using these capital stock estimates appears in Table A2. While the sectors are pooled, the coefficients on the inputs are allowed to vary by sector. A variety of functional forms were checked as a robustness, including both Cobb Douglas and translog specifications. The labor variables are instrumented in this regression with lagged past values, firm equity and investment in order to avoid potential simultaneity bias and/or these variables capturing current-period productivity effects.[33] This model accounts for approximately 77% of the variation in firm output, with capital and labour shares taking reasonable values.[34] The parameter estimates for the labour and capital variables are then used to construct our measure of firm total factor productivity.

In approximately 4% of our observations, one or more variables have been imputed by the statistical office. In estimating the capital stock equations and productivity equations, we excluded any firm with even one imputed value. We then took the coefficients and applied them to the whole sample to reduce potential measurement error.

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[31] The predictive regression for net book value of total assets is estimated using firm age; shares of capital held by the public sector and foreigners; the firm's legal status as well as time varying predictors such as lagged labour variables and investment information. Investment and capital stock values are deflated using the GDP deflator for machinery and equipment. A dummy variable for whether the firm existed in the previous period is also included. For firms that did not exist in the previous period, all lagged variables are set to 0. Given the use of lagged instruments, capital stock values cannot be predicted for the first year (i.e. 1985). Alternative measures of the capital stock were examined (e.g. estimated market value) but appeared to contain substantial measurement error as noted by Fafchamps and El Hamine (2004), so were not used in the regressions appearing in this paper.

[32] Clerides et al. (1998) used such an approach in estimating capital stock for Moroccan firms 1984-1991.

[33] The capital stock variable is a predicted variable and so is de-facto instrumented. Murphy and Topel (1985) have shown that such two-step procedures fail to account for the measurement error in the predicted variable and lead to biased standard errors on the predicted variable. Bootstrapping the capital stock variables with varying numbers of replications and sample sizes led to generally increased standard errors (and reduced t statistics) for the capital stock variables, but they remained significant at the 5% level. Given that any potential bias will be confined to the standard errors and the associated t statistics of the capital stock variables, the TFP estimates will be unaffected.

[34] System GMM estimation of the production function was explored but provided generally less plausible estimates for the input variables.

Table A1: Capital Stock Prediction

	Log of Net Book Value of Total Assets (2001)	
Firm Characteristics	**Coefficient**	**t-stat**
Age of Firm (log)	0.354	3.72**
Age of Firm (log squared)	-0.094	-4.49**
Foreign Equity Share of Total Equity	-0.303	-0.93
Public Equity Share of Total Equity	0.044	0.59
Dummy Variable if Sole Proprietorship^	-0.436	-7.33**
Dummy Variable if Corporation^	0.574	9.48**
Instruments		
Lagged Firm-level employment (log)	0.650	28.73**
Lagged share of casual workers in total firm workers	-0.193	-1.17
Dummy Variable if firm did not exist in previous year	1.867	16.25**
Investment (log)	0.295	18.38**
Dummy Variable if no investment	0.598	7.69**
Lagged Investment (log)	0.158	9.60**
Dummy Variable if no lagged investment	0.267	3.33**
Intercept	Included	
Location Dummy Variables	Included	
Sector Dummy Variables	Included	
R-squared	0.584	
Number of observations	5909	

Note: Standard errors have been computed using the White adjustment for heteroskedasticity.
^ Limited Liability is the omitted category
+ Significant at the 10% level
* Significant at the 5% level
** Significant at the 1% level

Table A2 TFP Estimation

	Deflated Firm-Level Revenue (log)	
Firm Characteristics (Marginal Effects)	**Coeff.**	**Std. Err.**
Firm-level employment (log)	0.659	0.018***
Casual Worker Share (%)	-0.448	0.047***
Predicted Capital Stock (log)	0.506	0.012***
Firm Age (Log)	0.198	0.022***
Firm Age (Log Squared)	-0.007	0.004
Public Ownership (%)	0.184	0.044***
Foreign Ownership (%)	0.122	0.014***
Sole Proprietorship (Dummy)	-0.156	0.012***
Corporation (Dummy)	0.044	0.011***
R-Squared	0.765	
Number of observations	71012	

Intercept included in the regression. Also included are agglomeration variables, and sector, province and year dummies. Firm-level employment, casual worker share, and capital are interacted with sector dummies. Firm-level employment and Casual Worker Share were instrumented with lagged firm employment, lagged casual share, and firm investment data. Standard errors have been estimated using the White adjustment for heteroskedasticity. Significance at the 1%, 5% and 10% levels is indicated by ***, **, and * respectively. The agglomeration variables allow for a structural break, with separate variables for the 1985-1993 and 1994-2001 sub-periods.

Table 1: Descriptive Statistics

Firm-Level Variables (1985-2001)	Obs	Mean	Median	Std.Dev.	Min	Max
Annual Production	99308	7444	605	86941	1	8011912
Annual Investment	79712	524	11	4523	0	431636
Public Equity Share of Total Equity	99308	1%	0%	8%	0%	100%
Foreign Equity Share of Total Equity	99308	10%	0%	27%	0%	100%
Export Share of Total Sales	99308	18%	0%	36%	0%	100%
Total Workers	99308	71	18	205	1	8011
Casual Worker Share (%)	99308	0.1	0.0	0.3	0	49
Firm Age	99308	15.0	11.0	13.4	1	102
Net Book Value of Total Assets	95301	6,680	638	42,851	2	3,513,793
Agglomeration Variables	**Obs**	**Mean**	**Median**	**Std.Dev.**	**Min**	**Max**
Province Level (1985-2001)						
Sectoral Employment in Location	99308	17,294	6,266	19,526	1	70,597
Total Employment in Location	99308	98,968	24,937	99,573	1	231,068
Diversity Index	99308	4.23	4.67	1.36	1.00	6.18
Firm Market Share (nat'l)	99308	0.12%	0.01%	0.74%	0.00%	51.91%
Firm Market Share (prov)	99308	4.22%	0.20%	14.00%	0.00%	100.00%
Competition HHI	99308	27.11	10.96	33.78	1.00	129.72
Number of Firms in location-sector	99308	213	89	217	1	696
Productivity Variables	**Obs**	**Mean**	**Median**	**Std.Dev.**	**Min**	**Max**
TFP	95301	1.68	1.70	1.07	-4.71	6.40

Table 2: Mean Comparisons

Comparison of Means	New Entrants	Surviving Incumbents	Exiting Firms
Observations (1985-2001)	8,263	86,211	5,336
Firm-Level Variables (1985-2001)			
Annual Production	1549	8301	2456
Annual Investment	540	543	201
Public Equity Share of Total Equity	0%	0	0
Foreign Equity Share of Total Equity	11%	0	0
Export Share of Total Sales	21%	0	0
Total Workers	35	76	45
Casual Worker Share (%)	0.1	0	0
Firm Age	4.1	16	14
Net Book Value of Total Assets	877	7495	2594
Agglomeration Variables			
Province Level (1985-2001)			
Sectoral Employment in Location	14,086	17,486	18,981
Total Employment in Location	75,475	100,908	101,943
Diversity Index	3.96	4	4
Firm Market Share (nat'l)	0.03%	0	0
Firm Market Share (prov)	3.94%	0	0
Competition HHI	24.80	27	30
Number of Firms in location-sector	176	215	227
Productivity Variables			
TFP	1.29	1.73	1.44

Table 3: TFP Transition Matrices

ROW PERCENTAGES

Establishment Group	Quintile 1 (2001)	Quintile 2 (2001)	Quintile 3 (2001)	Quintile 4 (2001)	Quintile 5 (2001)	Switch Out	Deaths	Row Total
Quintile 1 (1986)	10%	9%	6%	5%	4%	1%	65%	100%
Quintile 2 (1986)	8%	13%	10%	8%	4%	2%	54%	100%
Quintile 3 (1986)	7%	12%	13%	13%	5%	3%	47%	100%
Quintile 4 (1986)	4%	7%	13%	16%	11%	2%	47%	100%
Quintile 5 (1986)	2%	3%	5%	15%	28%	3%	44%	100%
Switch In	14%	9%	15%	27%	35%			100%
Births	23%	21%	20%	18%	19%			100%

COLUMN PERCENTAGES

Establishment Group	Quintile 1 (2001)	Quintile 2 (2001)	Quintile 3 (2001)	Quintile 4 (2001)	Quintile 5 (2001)	Switch Out	Deaths
Quintile 1 (1986)	6%	5%	4%	3%	3%	12%	25%
Quintile 2 (1986)	5%	8%	6%	5%	2%	17%	21%
Quintile 3 (1986)	4%	7%	8%	8%	3%	24%	18%
Quintile 4 (1986)	2%	4%	8%	10%	7%	21%	18%
Quintile 5 (1986)	1%	2%	3%	9%	17%	26%	17%
Switch In	1%	1%	1%	2%	2%		
Births	80%	73%	70%	64%	66%		
Column Total	100%	100%	100%	100%	100%	100%	100%

Quintile 1 is low productivity; Quintile 5 is high productivity

Number of firms in 1986 is 4358; number of firms in 2001 is 7251

Table 4: Productivity Regression with Agglomeration Variables and Firm Fixed Effects

	Predicted TFP		Predicted TFP	
	Coeff.	**Robust Std. Err.**	**Coeff.**	**Robust Std. Err.**
Firm Characteristics				
Casual Worker Share (%)	-0.161	0.115	-0.175	0.122
Firm Age (Log)	0.804	0.030 ***	0.537	0.023 ***
Firm Age (Log Squared)	-0.242	0.015 ***	-0.142	0.012 ***
Agglomeration Variables (1986-1993)				
Sectoral employment in location (log)	-0.111	0.025 ***	-0.093	0.022 ***
Total employment in location (log)	0.000	0.030	0.020	0.025
Diversity Index (log)	-0.038	0.041	-0.002	0.036
Number of firms in location-sector (log)	0.041	0.034	0.008	0.029
Competition HHI (log)	0.073	0.018 ***	0.073	0.016 ***
Agglomeration Variables (1994-2001)				
Sectoral employment in location (log)	-0.028	0.024	-0.024	0.021
Total employment in location (log)	-0.084	0.032 ***	-0.051	0.026 **
Diversity Index (log)	-0.081	0.042 *	-0.054	0.035
Number of firms in location-sector (log)	0.043	0.032	0.020	0.028
Competition HHI (log)	0.046	0.015 ***	0.038	0.013 ***
R Squared	0.016		0.041	
Number of observations	78708		95301	

Standard errors have been estimated using the White adjustment for heteroskedasticity. Significance at the 1%, 5% and 10% levels is indicated by ***, **, and * respectively. The agglomeration variables allow for a structural break, with separate variables for the 1985-1993 and 1994-2001 sub-periods. Year dummies are included and firm fixed effects. The second regression includes all firms, including those with imputed values for specific missing values.

Figure 1: Entry and Exit Rates in Moroccan Manufacturing (1986-2001)

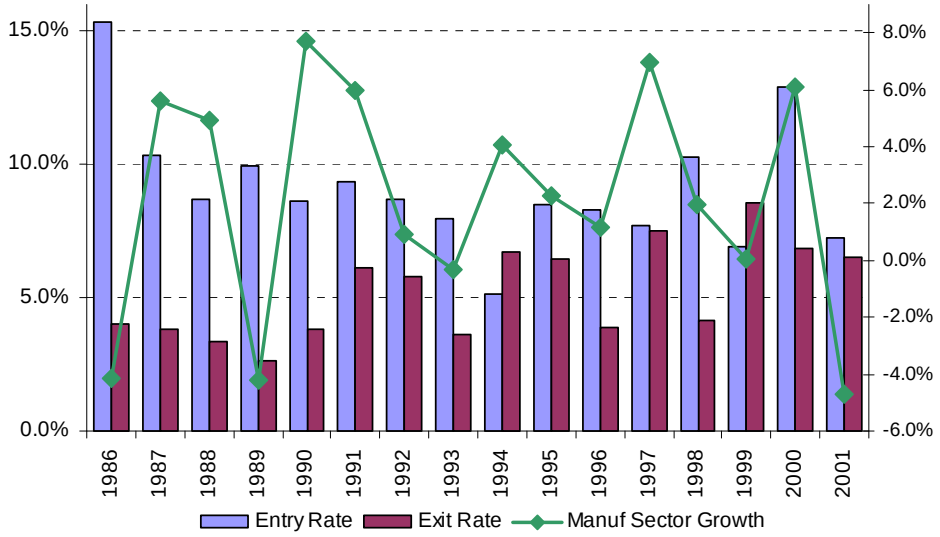
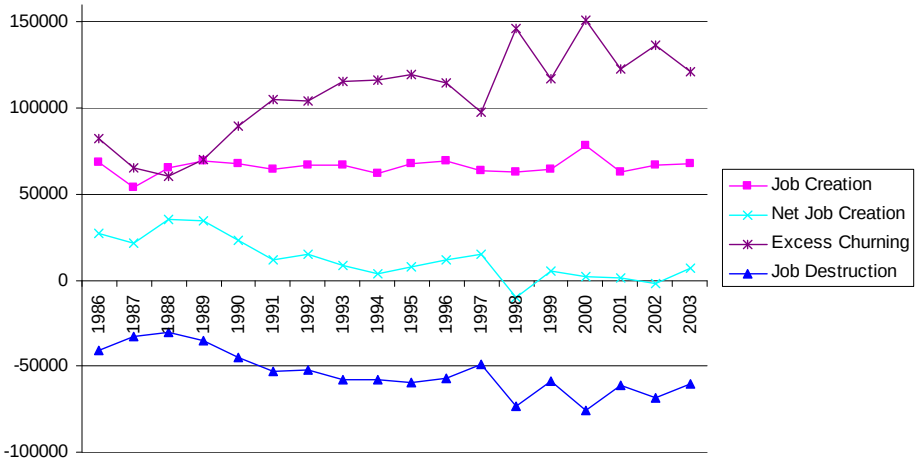
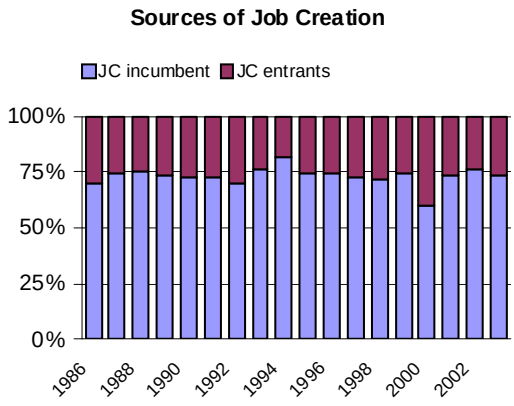


Figure 2: Job Creation and Job Destruction (1986-2003)





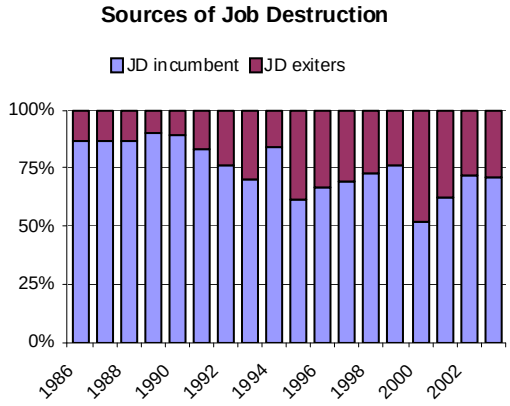


Figure 3a. Post Entry Productivity Trends

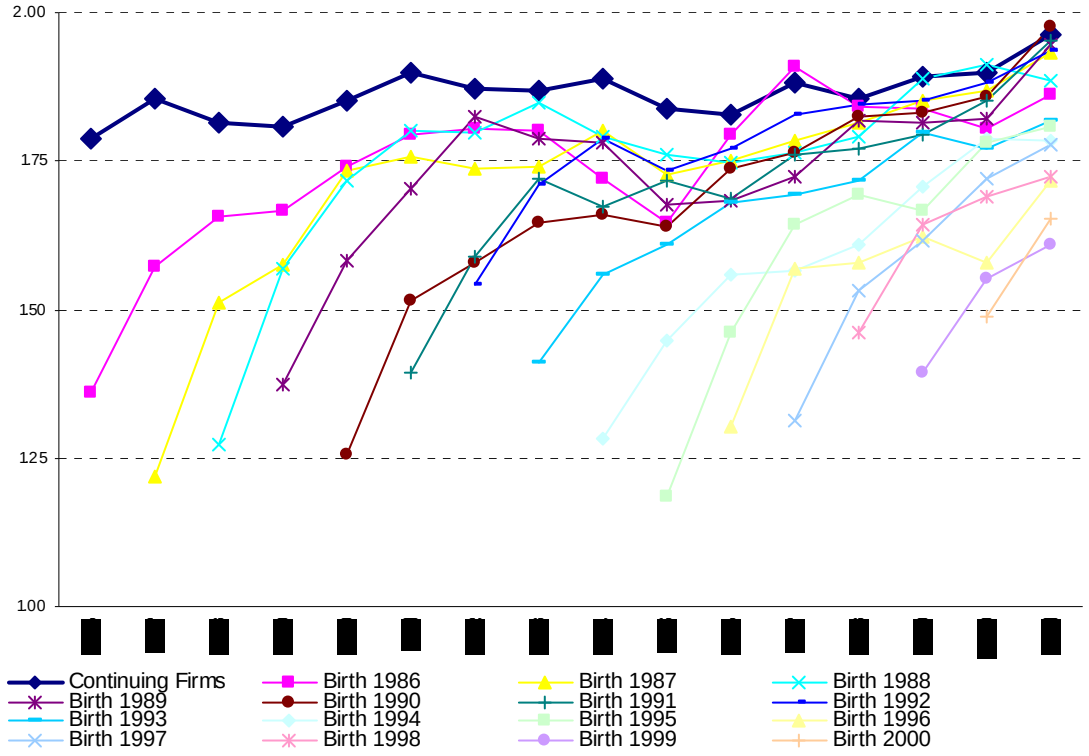


Figure 3b: Pre-Exit Productivity Trends

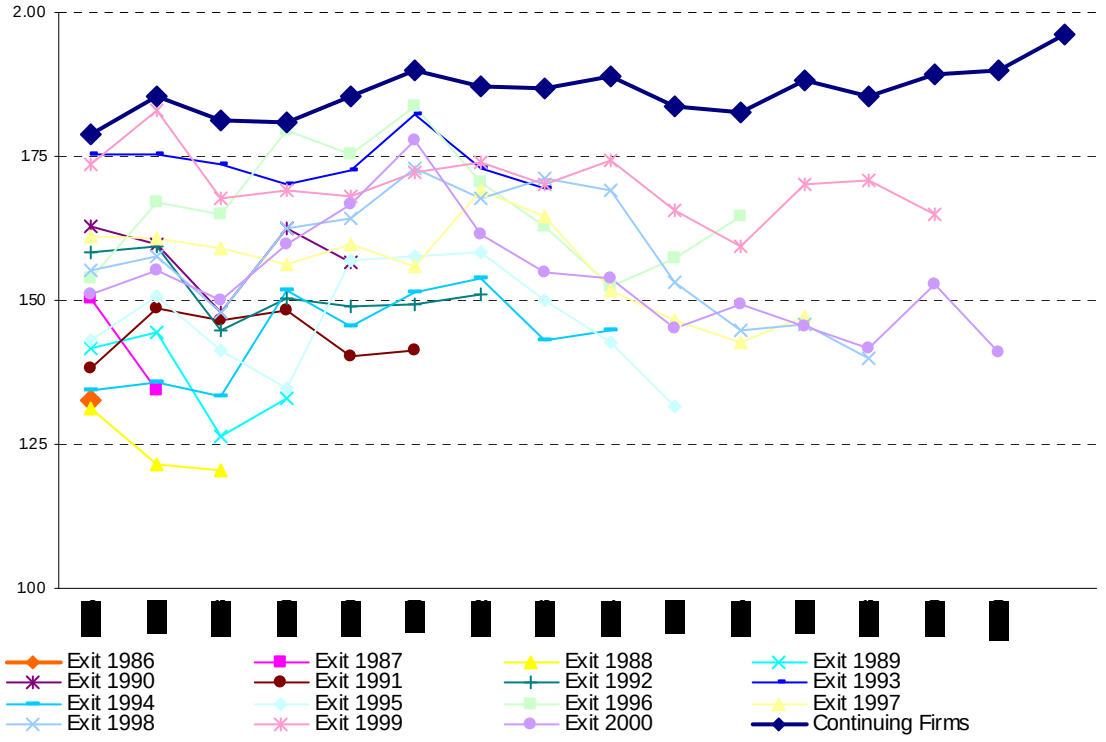


Figure 4a: Baily, Hulten and Campbell (1992) Labor Productivity Decomposition

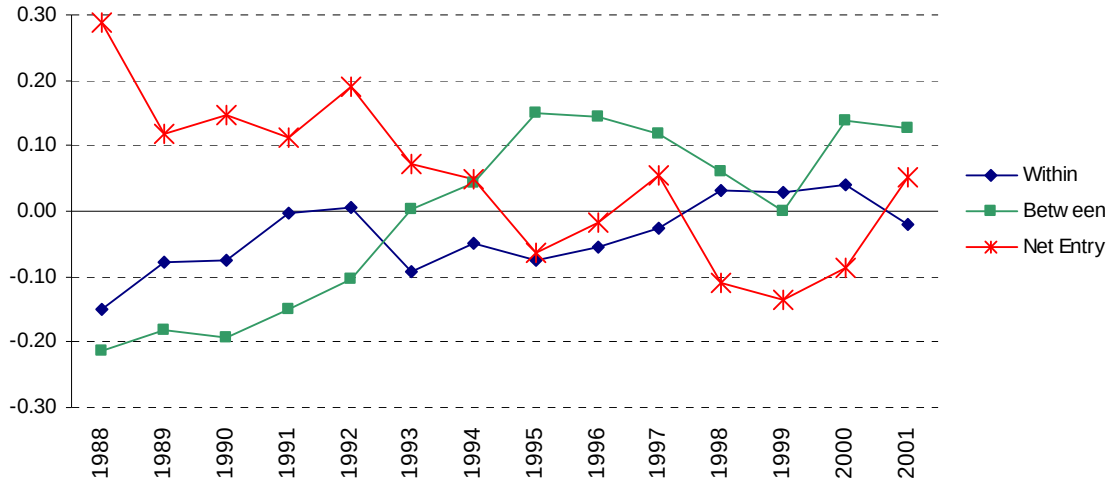


Figure 4b: Baily, Hulten and Campbell (1992) TFP Decomposition

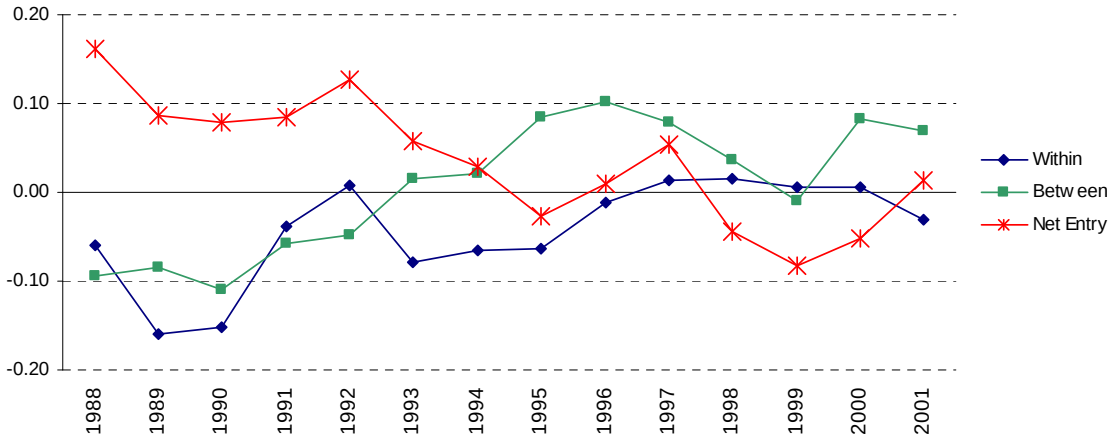


Figure 4c: Baily, Hulten and Campbell (1992) TFP Decomposition by Sector

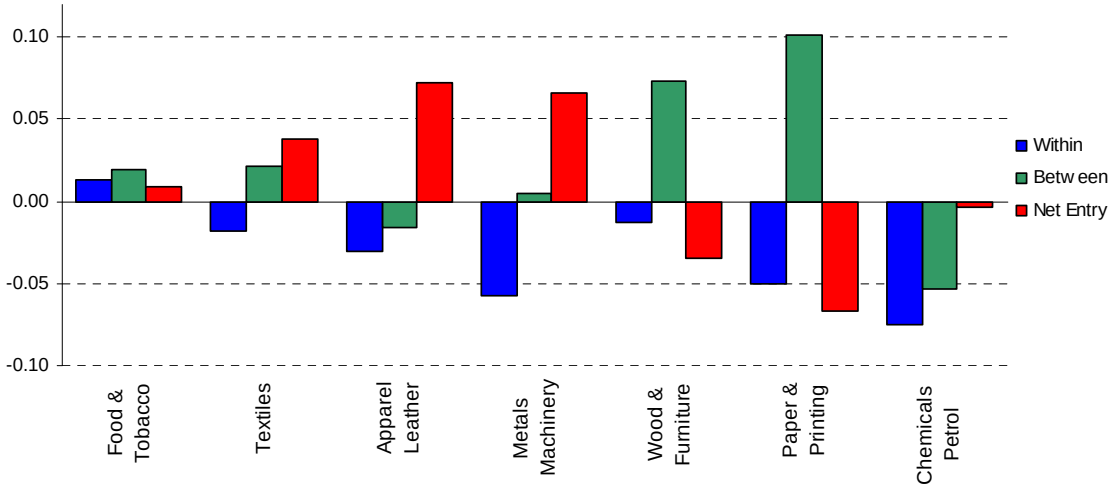


Figure 5a: Foster, Haltiwanger and Krizan (2001) Labor Decomposition

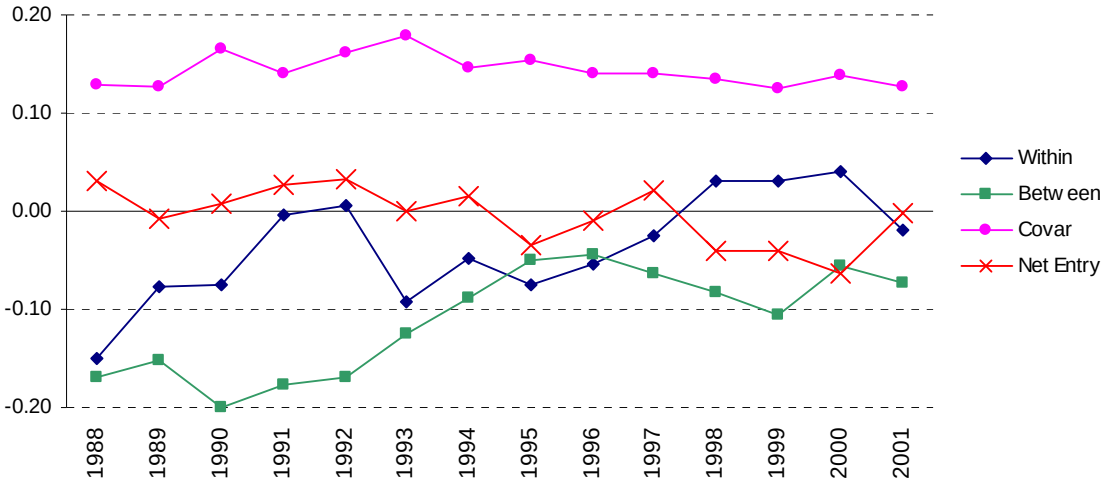


Figure 5b: Foster, Haltiwanger and Krizan (2001) TFP Decomposition

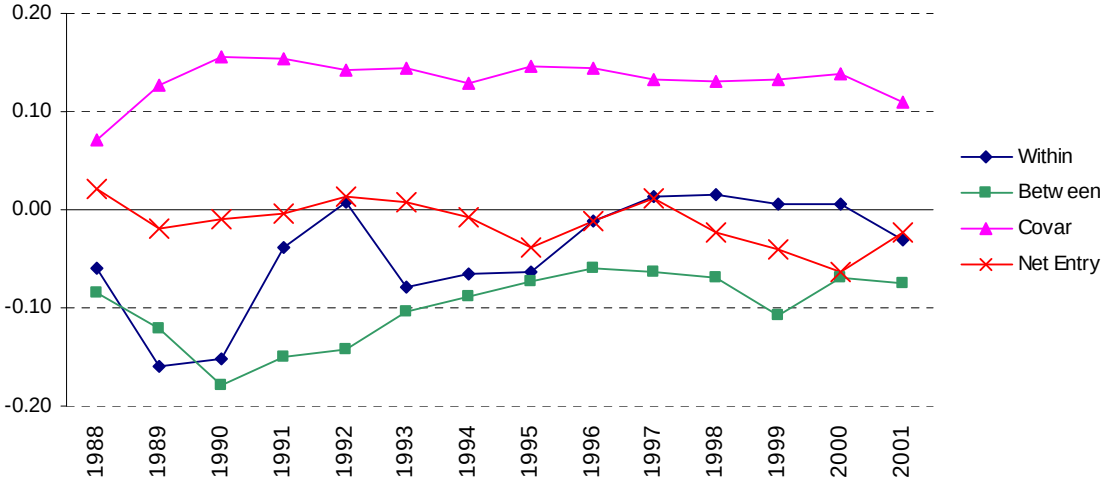


Figure 5c: Foster, Haltiwanger and Krizan (2001) TFP Decomp. by Sector

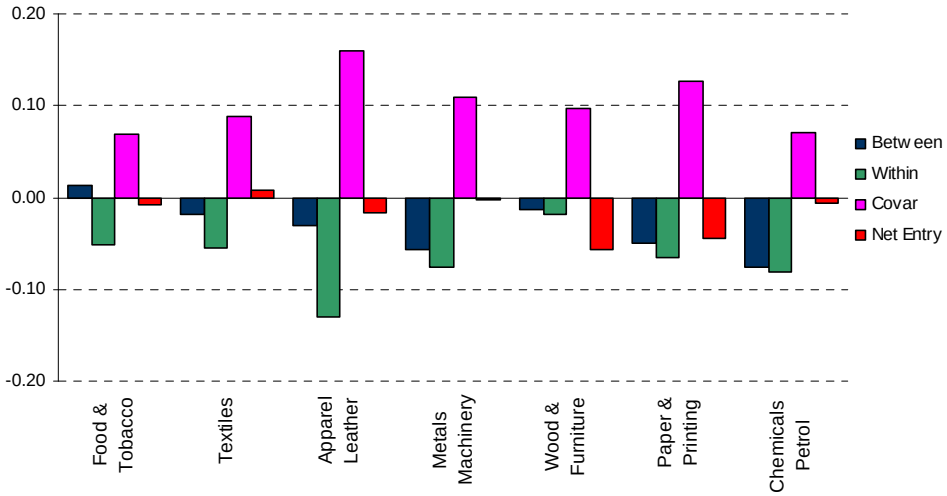


Figure 6a: Griliches and Regev (1995) Labor Productivity Decomposition

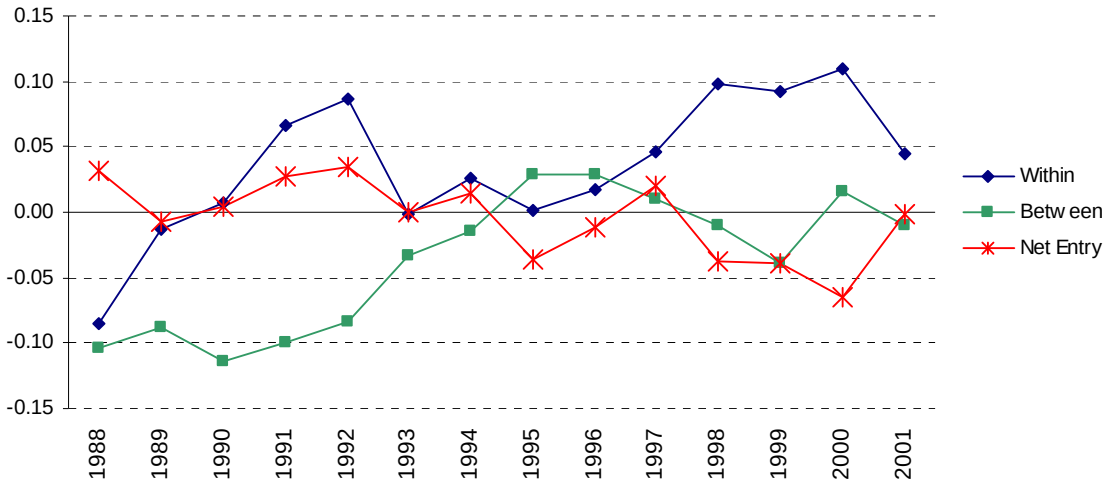


Figure 6b: Griliches and Regev (1995) TFP Decomposition

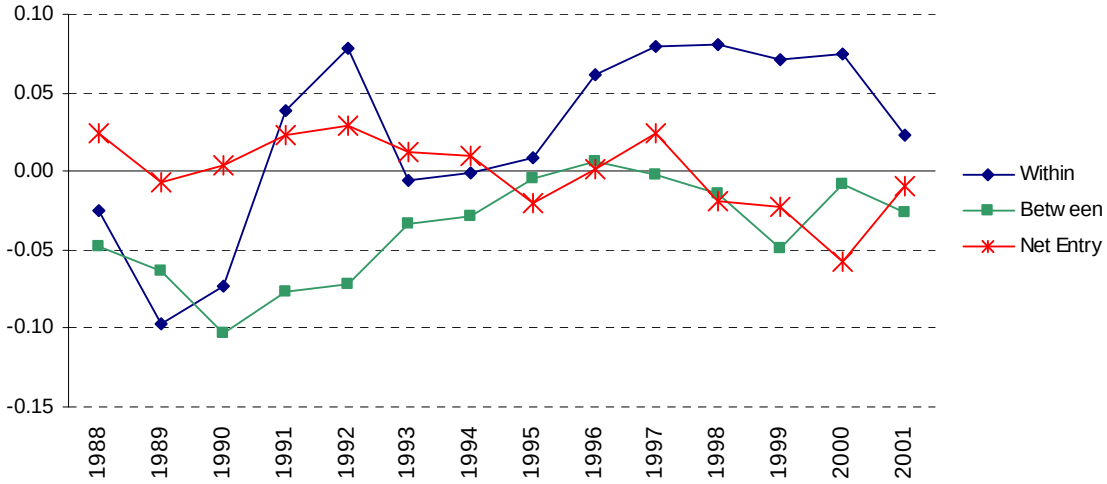


Figure 6c: Griliches and Regev (1995) TFP Decomposition by Sector

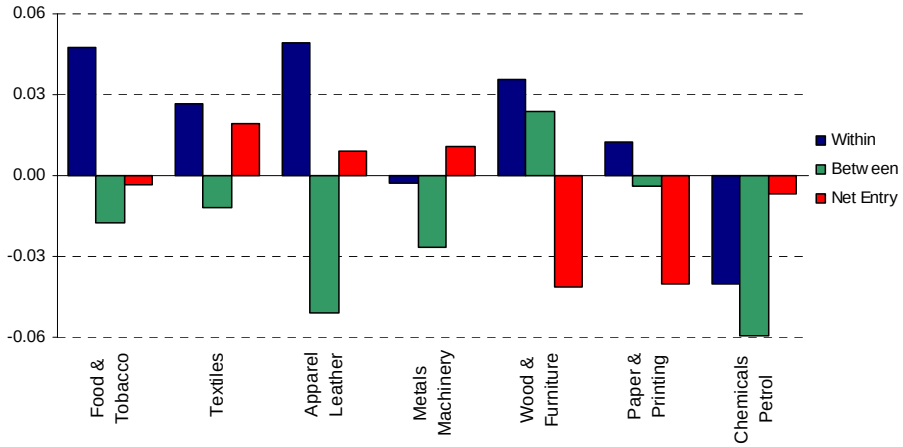


Figure 6d: Griliches and Regev (1995) TFP Decomposition
Using 1 year time intervals

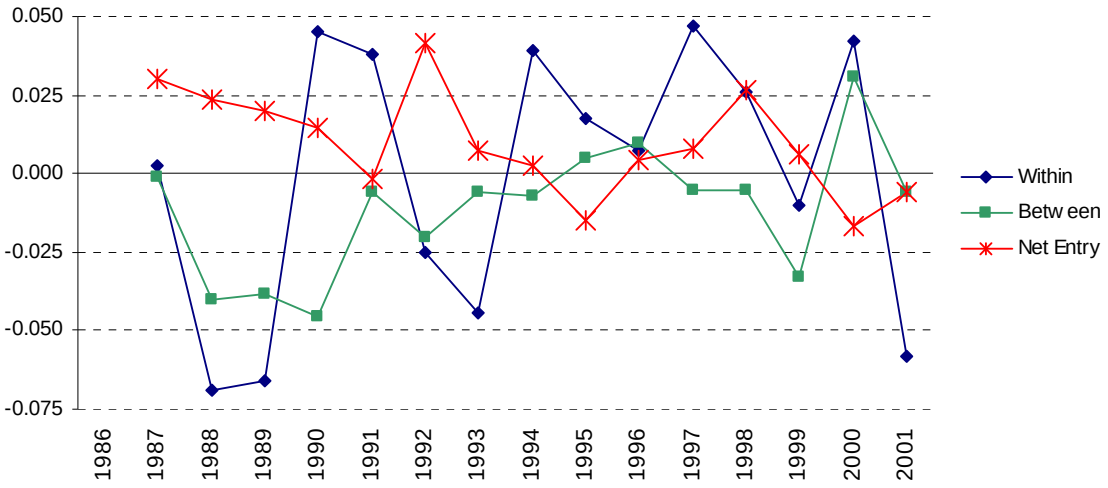


Figure 7: Higher firm turnover is associated with higher subsequent productivity growth of incumbents

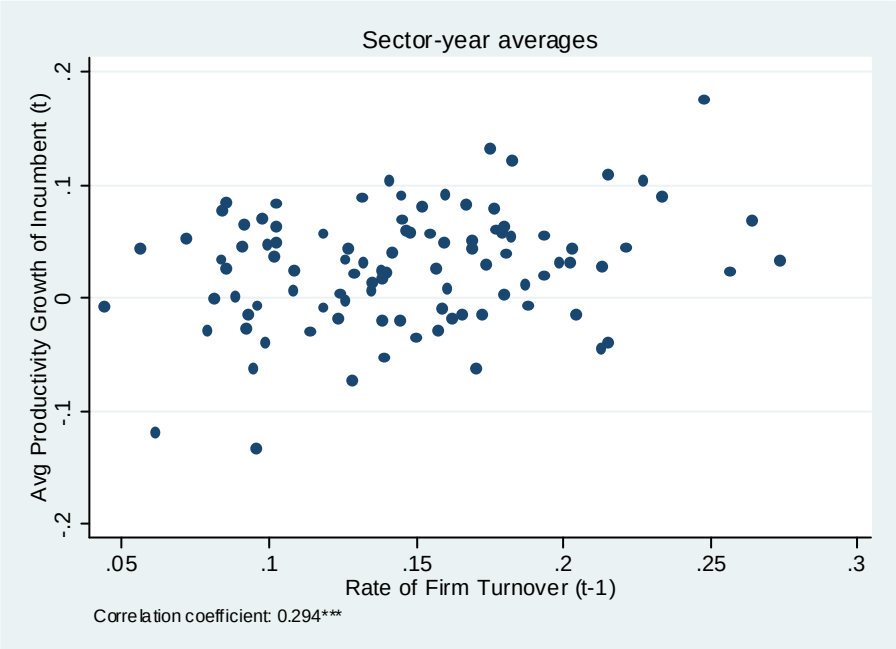
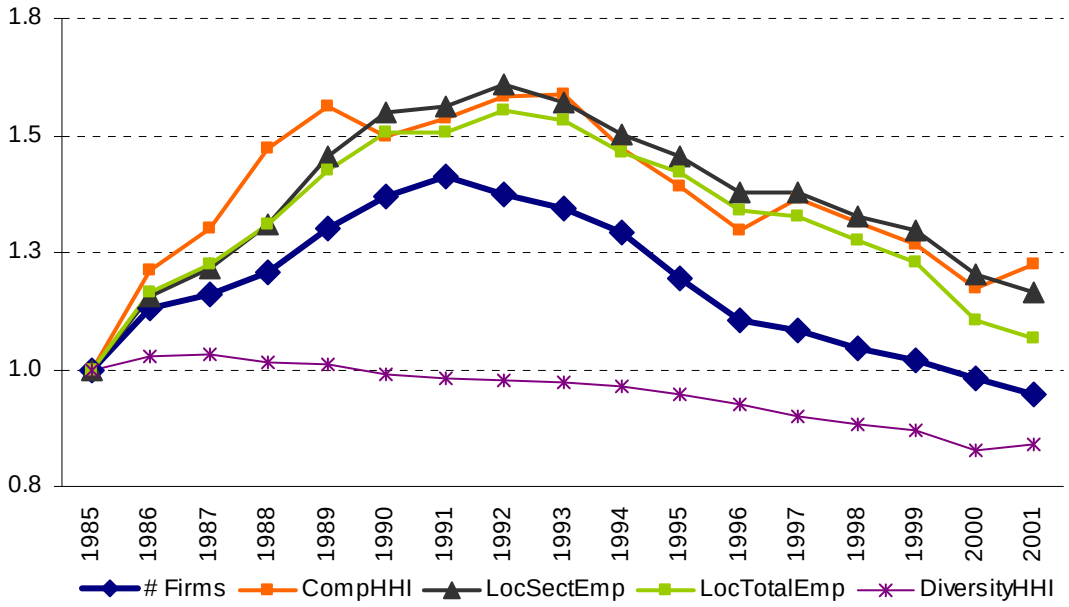


Figure 8a: Net Turnover and Agglomeration Externalities through Time



8b: Changes in firm turnover and changes in agglomeration externalities