93 **Economie et Statistiques**
Working papers du STATEC

march 2017

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This study explores the effects of the 2008 global economic crisis on the labor allocation and productivity in Luxembourg. The analysis is based on firm-level data from manufacturing and non-financial service sectors and finds a dramatic productivity slowdown after 2008. The study reveals that the cleansing effect of recession did not function effectively which would otherwise improve the efficiency in the labor allocation and counterbalance the productivity slowdown. The firm entry and job creation rates are lower in the post-crisis period, but the job destruction is not significantly altered by the crisis. The findings call attention for the strict employment protection legislation that possibly plays a role in preventing reallocation towards more efficient establishments. Relaxing the employment protection legislation simultaneously with facilitating the entry and growth of young firms is expected to promote creative destruction, improve allocative efficiency and speed up the post-crisis recovery.

Keywords: labor productivity, allocative efficiency, recession, job creation and destruction, firm size and age.

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This study explores the effects of the 2008 global economic crisis on the labor allocation and productivity in Luxembourg. The analysis is based on firm-level data from manufacturing and non-financial service sectors and finds a dramatic productivity slowdown after 2008. The study reveals that the cleansing effect of recession did not function effectively which would otherwise improve the efficiency in the labor allocation and counterbalance the productivity slowdown. The firm entry and job creation rates are lower in the post-crisis period, but the job destruction is not significantly altered by the crisis. The findings call attention for the strict employment protection legislation that possibly plays a role in preventing reallocation towards more efficient establishments. Relaxing the employment protection legislation simultaneously with facilitating the entry and growth of young firms is expected to promote creative destruction, improve allocative efficiency and speed up the post-crisis recovery.

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JEL Classification: D20, D61, J24, L11, L16

1 Introduction

Luxembourg is considered to be one of the few economies in Europe that rode out the 2008 global economic crisis without paying high costs. Macroeconomic indicators show that unemployment rates are maintained at a reasonably low level, and a sound public finance position is sustained throughout the recession. This study, however, finds a rapid productivity slowdown in the manufacturing, construction and non-financial private service sectors. More strikingly, no significant recovery is observed and aggregate labor productivity decreases continuously until the end of the sample period.

The cleansing effect of recessions plays an important role in the post-crisis recovery by clearing the market from inefficient production units. The cleansing effect triggers the restructuring process by releasing a portion of production factors that were once used inefficiently. The released resources and market share can motivate the entry of new firms or provide further growth opportunities for surviving more productive incumbents. This would increase the efficiency in the factor allocation and alleviate the productivity

*This work is done as a part of a research project co-funded by the Marie Skłodowska-Curie actions and the FNR, Luxembourg. This work is independent of the STATEC and all errors are mine.

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slowdown for a given technological frontier. The cleansing effect of recessions, therefore, can active the channels through which an economy overcomes crises, but whether it functions effectively crucially depends on the regulatory environment influencing factor mobility and firms' exit decisions.

This study provides a closer look at the impact of the crisis and patterns of recovery in the main sectors of Luxembourg from a microeconomic perspective, namely using firm-level data. Available evidence (e.g. OECD, 2012; 2013) shows that labor market regulations are strict in Luxembourg relative to other countries, which would restrict labor mobility across firms. This study, therefore, puts a particular focus on understanding whether the efficiency in the allocation of labor is distorted after the crisis and whether there is a room for a more efficient reallocation.

The first step in the analysis is the decomposition of aggregate productivity which enables to observe the extent of factor reallocation and the response of firms to the external shock. In the second step, the emphasis is on the employment dynamics, so that the patterns in job creation and destruction during the recession are investigated. I evaluate the empirical results in the light of the theoretical literature, so that the observed dynamics are compared with those expected to be seen in a frictionless labor market. Based on the comparison between the theory and the empirical findings, this study develops a discussion over alternative economic policies and evaluates their potential to overcome technological sclerosis and to speed up the economic recovery simultaneously.

The findings reveal that an important portion of firms experienced different degrees of negative productivity shocks during the crisis. The change in the firm-level productivity distribution, however, is not followed by significant labor reallocation towards more productive establishments. Furthermore, the job destruction did not noticeably react to the negative external shock, which implies the cleansing effect of the recession was weak in Luxembourg. The empirical results underline the need for relaxing the employment protection legislation to facilitate the restructuring process, but such a policy alone would cause an increase in unemployment that can be long-lasting during the recession times. This paper, therefore, considers stimulating job creation as a prior economic policy that can accelerate labor reallocation through creative destruction and complement the reforms toward relaxing the employment protections.

Encouraging job creation by economic policy requires detecting a target firm group that has high job creation potential. For this purpose, this paper also employs a regression analysis that links job creation and destruction with firm characteristics. The results contradict the perception that the small and medium-sized establishments are the engines of job creation. Young firms, however, create a disproportionate number of jobs in Luxembourg, but they are also more fragile to the external shocks especially in some service sectors. Thus, facilitating entry and development of new producers seems to be critical in the recovery phase, while policies preventing firm exit would possibly exacerbate long-run unemployment and technological sclerosis by disrupting creative destruction.

The following section describes the micro data. Section 3 depicts the macroeconomic impact of the recession on the output and employment. Section 4 introduces firm-level data into the analysis and evaluates the functioning of cleansing mechanism by investigating firm dynamics, labor productivity and allocative efficiency in the main sectors. Section 4 also discusses the strictness of the current labor market regulations and their possible impact on firm dynamics. Section 5 studies the patterns of job creation and destruction and assesses the impact of recession on worker turnover. Section 5 also analyzes the link between net job creation and firm characteristics with the aim of providing some

benchmarks for policy discussions. Section 6 evaluates the empirical findings and derives implications for economic policy that is aimed at accelerating the post-crisis recovery.

2 Dataset

The source of micro data used in this study is the Business Register that consists of time series for firms in the manufacturing, construction and non-financial private business service sectors and covers the period from 1996 to 2011. The advantage of using the Register is its full coverage, so that the data contains full time series of observations for every firm operated in the sectors. The micro sample in this study excludes the financial sector, mining, agriculture and public services and covers roughly two third of all employment in Luxembourg as of 2011. In the Register, the variables of interest are firms' turnover, number of employees, birth year and exit status. Thus, one can recover the age, entry and exit years of establishments based on actual observations rather than the occurrence or absence of data. The Business Register, however, does not include observations for inputs other than labor, so that the analysis is restricted to labor productivity as a ratio of price-adjusted turnover to number of employees.[1]

The empirical analysis employs industry-level variables such as the producer price index at the 2-digit level from the LuxKlems (Peroni, 2012) database, the aggregate employment, working hours and output indicators from the National Accounts Statistics of Luxembourg. The output price index is used to deflate the firm-level turnover which is used to calculate labor productivity. The other aggregate-level variables are utilized in the next section to depict the macroeconomic outlook of Luxembourg's economy. Descriptive statistics for the micro data can be found in the appendix section.

3 An Aggregate Overview of Luxemburg's Economy

In the last 40 years, Luxembourg's economy has undergone a period of structural change, during which large amounts of productive resources were reallocated from mining and quarrying to financial intermediation. In particular, the steel industry's share in the total value-added shrunk from 25 percent in the early 1970's to 2 percent in 2000's, while the value-added share of the financial sector was less than 5 percent in 1970 and rose to 28 percent in 2002. This large-scale transformation in the domestic production structure influenced the evolution path of the economy. Following the decline in mining and quarry activities, there has been a contraction in the total employment of the manufacturing of metal products, which is still the largest manufacturing industry in Luxembourg with over 10.000 employees and on average 33 percent employment share in the sector's total. As of 2010, the share of total manufacturing in the economy fell below 15 percent in terms of both employment and value-added, which makes the domestic market share of Luxembourg's manufacturing sector one of the smallest among the European countries.

[1] An alternative dataset could be the Structural Business Survey (SBS) that contains a wider set of variables, but its coverage is limited in Luxembourg. The SBS excludes more than half of the firms or the total labor in service sectors. Moreover, the SBS does not cover a great portion of small and young firms whose job creation and destruction performance is of particular interest in this study. To test the robustness of results retrieved using the Business Register, I compare them with those based on the SBS. The results do not significantly differ for the sectors where the SBS covers more than half of the firm population.

The specialization towards production of financial services influenced the growth paths of the other service sectors producing complementary services to financial products, such as the administrative and support activities and the professional, scientific and technical activities. The expansion in financial as well as other service sectors brought about the migration of large numbers of skilled-employees which contributed into the expansion of the construction sector. The shrinkage in the share of manufacturing, and comprehensive free trade agreements boosted wholesale and retail trade activities that is the largest 1-digit non-financial service sector in Luxembourg with more than 70000 employees as of 2008. Hence, the import penetration rate in Luxembourg (218%) is the highest among all the EU and OECD economies. The increase in trading activities possibly influenced the rapid growth of the transportation and the storage sector where the total employment increased around 70 percent between 1999 and 2011.

Luxembourg's financial sector-led growth strategy can be considered successful in stimulating real GDP growth especially in the early phases of the financial globalization episode, while there is some recent evidence that it aggravates the fragility of the local markets to shocks from abroad. The OECD (2012) stresses the importance of diversification in economic activities as a long term strategy to cope with financial crisis. This study also is expected to contribute into the design of policy strategies to promote economic growth outside the financial sector.

Luxembourg's economy was hit by two major shocks within the sample period of this study. The first one is the 2001-2002 recession during which the real GDP growth rates fell from 9 to 1 percent. The first recession affected the financial sector instantly, and negative real value-added growth rates were observed in 2002. The response of manufacturing and non-financial private service sectors to the first shock was mild in terms of output growth.

In comparison to the earlier recession, the impact of the 2008 global crisis is felt more intensely in Luxembourg's economy. Figure 1 displays time paths of output and value-added for manufacturing and non-financial services plus construction. On the left-hand side, the gross output (total revenues deflated by the 2-digit PPI) of manufacturing sector drops down rapidly in 2008 and 2009, but the decline is mostly recovered one year after. The time path in the value-added, however, is different in the post-crisis period. After 2007, the value-added in manufacturing continuously decreases, and no significant recovery is observed within the sample period.

On the right-hand side of Figure 1, the time paths of gross output and value-added are depicted for the total of construction and service sectors. The paths are similar to those in manufacturing, so that the temporary decline in the gross output during the crisis is fully recovered by the end of the sample period. The decline in the value-added of the service sectors, however, is sharper in comparison to the gross output and long-lasting. The recovery in the gross output but not in the value-added shows that firms employ intermediate inputs more intensively after the crisis. One possible reason for this is that establishments tend to rely more on flexible inputs to avoid long term contracts and to alleviate the risks due to increased uncertainty. In other words, employing more of intermediate inputs gives firms the opportunity to be more flexible in the crisis period. Firms, however, may find it more difficult to quickly adjust their number of employees in recession times due to hiring and firing restrictions.

Figure 1: Gross Output vs. Value-Added

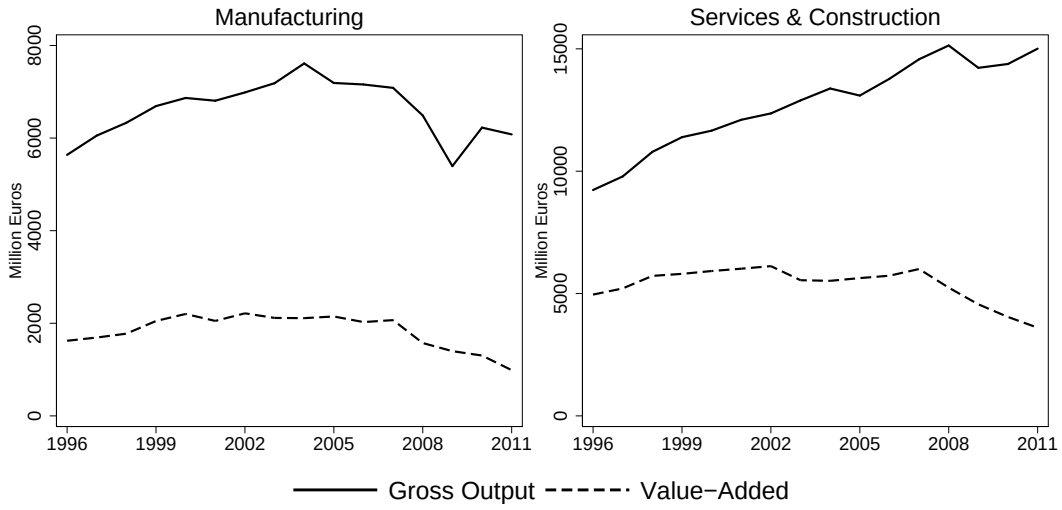


Figure 2 displays the total number of employees and the average annual working hours per employee. The left-hand side of the figure shows that the total number of employees as well as the average work-hours decreases after 2008 in the manufacturing sector. The joint decrease in employment and work-hours is partially recovered by the end of the sample period. On the right-hand side, the total employment of construction and non-financial private service sectors follows an overall increasing pattern with two breakpoints corresponding to the early (2001-2002) and the recent crisis. The average work-hours, however, is rather stable until 2008 but lower afterwards.

Figure 2: Employment vs. Average Work-Hours

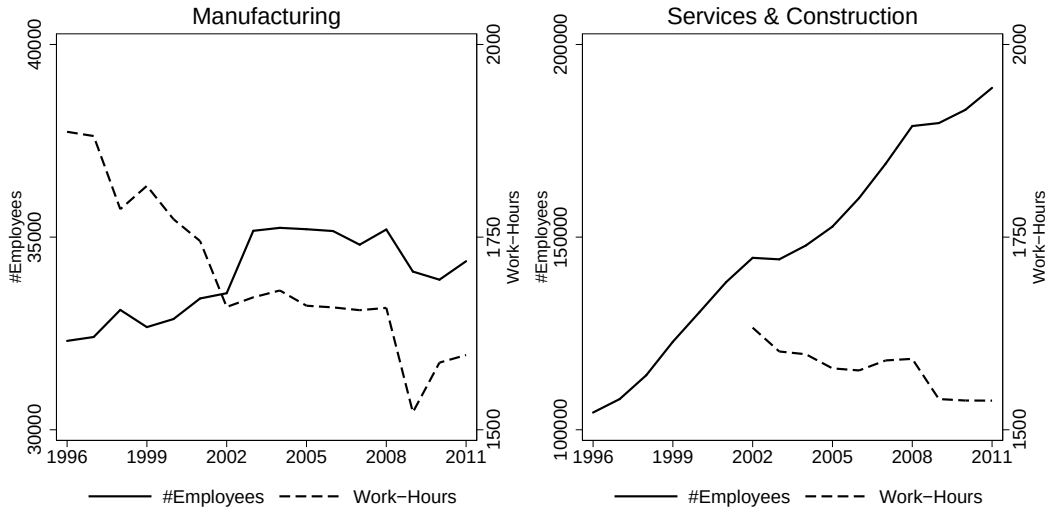


Figure 2 provides some degree of evidence to the presence of labor hoarding after 2008 which is somewhat expectable in an economy under the influence of a global negative shock. The extent of labor hoarding is linked to the magnitude of labor adjustment costs stemming from the institution and regulations. The following section puts the main focus on the factor adjustment patterns and regulatory restrictions on labor mobility.

4 Misallocation and Productivity Slowdown

Efficient allocation of resources is a state of an industry where larger portions of production factors are employed by more productive establishments. When the firm-level productivity distribution changes, for instance, due to idiosyncratic shocks or firm entry and exits, the reallocation mechanism moves resources toward more productive businesses and raises aggregate productivity growth for a given technological frontier.[2] Well-functioning reallocation mechanism can alleviate productivity slowdown and speed up the recovery after an economic downturn. Excessive regulatory burden on factor mobility, however, can disrupt this mechanism.

A considerable amount of evidence shows that productivity enhancing reallocation can increase during recession times. Caballero and Hammour (1994) argue that inefficient producers suffer more during an economic downturn and are more likely to shrink or exit. The released production factors and market share from the exiting producers provide new profit opportunities for more productive incumbents or potential firms. Davis and Haltiwanger (1992, 1999) and Baily et al. (2001) find increased reallocation in manufacturing during recession times. Davis et al. (2012) provide supportive evidence to increased reallocation in recessions for the entire private sector. Caballero and Hammour (1996), however, point out that distortions to factor reallocation such as labor market inefficiencies may hinder the cleansing function of recession by increasing the cost to shut down an outdated production unit. This, in turn, causes slow recovery in job creation and persistent fall in aggregate productivity in post-recession periods. Foster et al. (2013) suggest that while productivity enhancing reallocation generally increases in recessions, during the Great Recession in the US, the intensity of reallocation fell rather than rose. The sluggish factor adjustment is associated with the credit market distortions that restrict efficient allocation of capital.

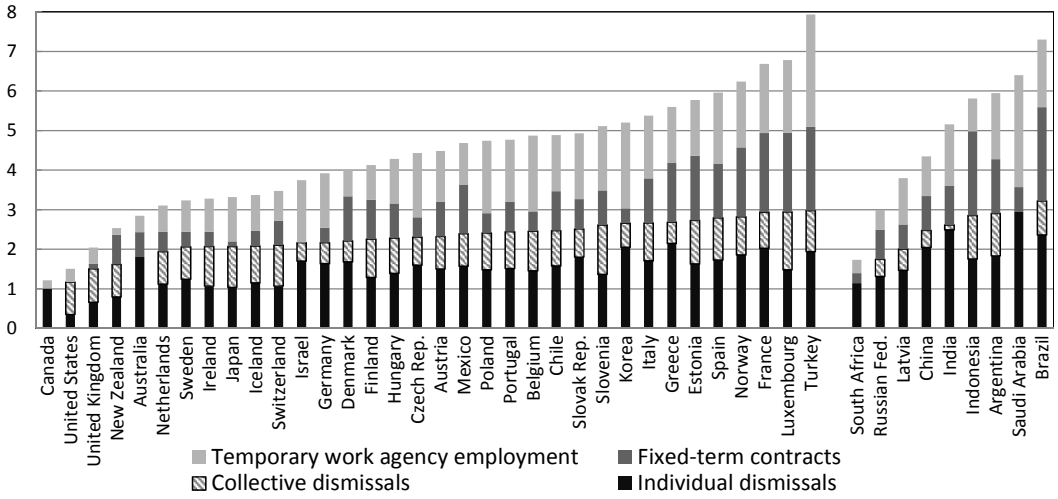
Regulatory restrictions on labor mobility reduce producers' flexibility to response external shocks by preventing job separations and by discouraging job creations (Mortensen and Pissarides, 1994). In particular, strict employment protection raises labor adjustment costs, which in turn impedes the reallocation of labor toward most productive uses (Martin and Scarpetta, 2012). Autor et al. (2007) find evidence that strict employment protection negatively influences firm entry and job turnover rates in the U.S. They further detect a positive impact of stricter job security provisions on capital deepening and a negative impact on total factor productivity. Empirical evidence also suggests that high mobility of labor enriches the quality and number of new job opportunities (e.g. Postel-Vinay and Robin, 2002). Schivardi and Torrini (2008) show that besides slightly reducing firms' growth prospects, employment protection was not really effective in providing stable jobs in Italy. Kugler et al. (2003) find that lowering the dismissal costs and payroll tax increased labor mobility and raised the employment rate for young and older men on permanent contracts in Spain.

The OECD publishes the indicators of employment protection (IEP) that measures the strictness of regulations aimed at preventing job losses. More specifically, the IEP encompasses scores for the strictness of the legal framework governing the individual and collective dismissals and the hiring of workers on fixed-term or temporary work

[2]Emerging body of empirical evidence shows that much of the differences in economic performance across countries can be explained by the efficiency in the allocation of production factors. An incomplete list of studies in this direction includes Banerjee and Duflo (2005), Jeong and Townsend (2007), Alfaro et al. (2008), Hsieh and Klenow (2009) and Bartelsman et al. (2013).

agency contracts. The IEP is often used as a measure of the efficiency in the labor market regulations in the applied research. Based on the EPI, the OECD (2010), for instance, provides empirical evidence that strict employment protection through regular contracts reduces worker reallocation rate. Haltiwanger et al. (2014) detect significant difference in the job reallocation rates between countries with the most and least strict employment protection legislation according to the IEP. Their findings further emphasize that stringent employment protection particularly deteriorates creative destruction by raising the costs of entry and exit.

Figure 3: Strictness of Employment Protection, 2013 [a]



[a]Source: http://www.oecd.org/employment/emp/oecdindicatorsofemploymentprotection.htm

In the calculation of the IEP, the OECD (2013) considers the regulations that directly affect the flexibility of labor market. The IEP is constructed based on the procedures and costs involved in dismissing individuals or groups of workers and the procedures involved in hiring workers on fixed-term or temporary work agency contracts.[3] Figure 3 depicts the index values of the four subcategories of the IEP for a selection of countries. Each subcategory is scaled between 0 and 6, and represents an aggregated value for a set of components whose scores are averaged to reach the final rankings.[4] Figure 3 presents the indicators for 2013, but Luxembourg's ranking does not change since 2008.

In Luxembourg, the notice periods in individual and collective dismissals are relatively long, so that the two dismissal indicators shown in Figure 3 are high. The legally valid cases for fixed-term contracts and temporary agency work are restrictive, and the maximum duration of fixed-term contracts is short, all of which raise the score for the regulatory strictness in fixed-term contracts and temporary agency employment. According to the cumulative rankings of the subcategory indicators, Figure 3 shows that Luxem-

[3]Venn (2009) suggests that the IEP is robust to alternative classification and weightings of subcategory components.

[4]The IEP's for the individual and collective dismissals are computed based on the length of notice periods, the amount of severance payments, definition, coverage and the amount of compensation for unfair dismissals. The indicators for the temporary work agency employment and fixed-term contracts measure the strictness of regulations such as the legal framework determining the activities appropriate to temporary contracting, restrictions on number of contract renewals, maximum duration of temporary assignments and fixed-term contracts, equal treatment of regular and temporary agency workers.

bourg has the second most strict employment protection legislation within the OECD members and the third among all listed countries.

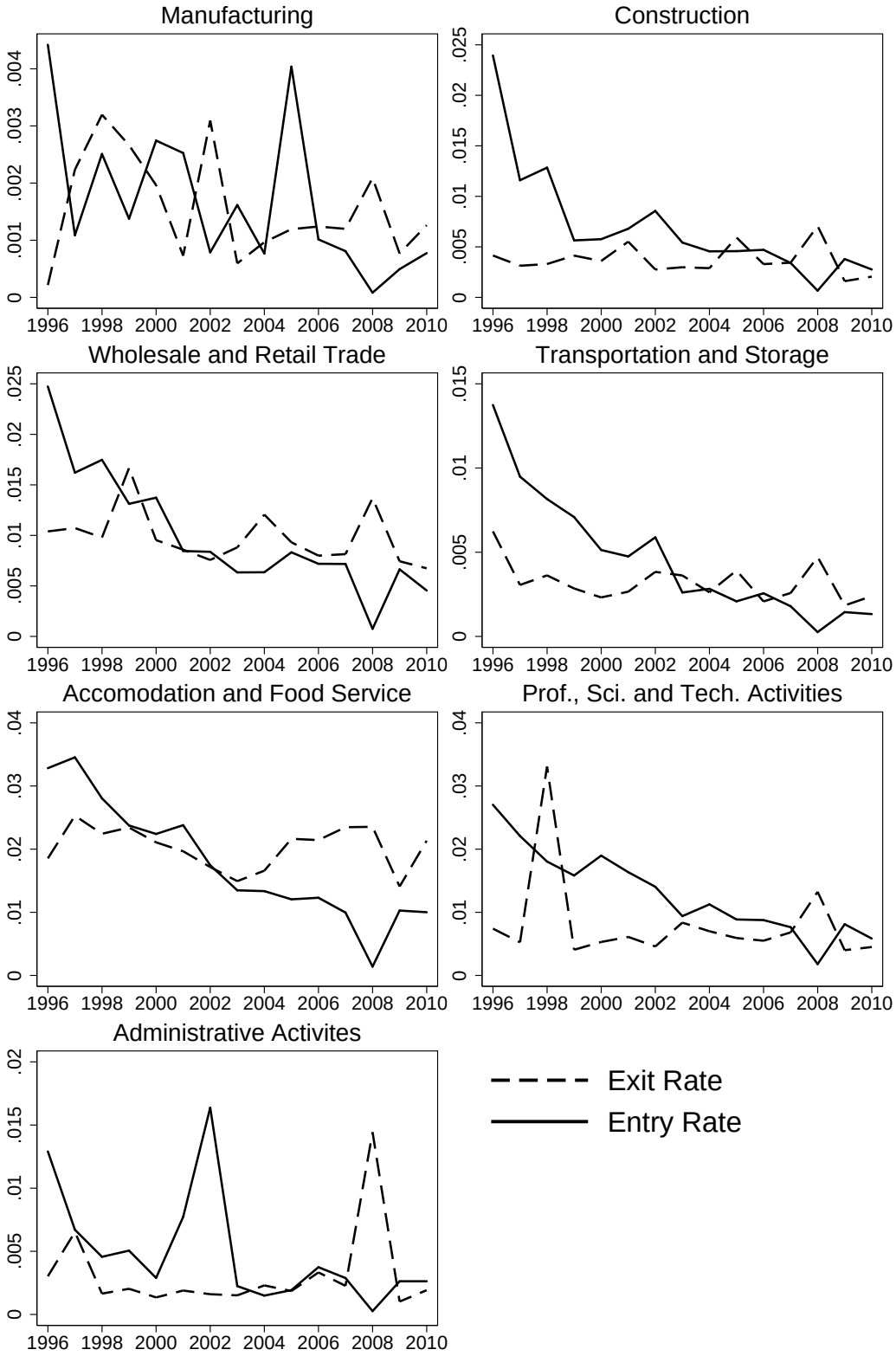
The empirical analysis in the following sections first aims to assess whether the labor reallocation is inefficiently slow during the recession period. Doing so provides insights into whether there is a need for faster labor reallocation, so that relaxing the employment protection legislation can be considered as a policy strategy. In the second step, the feasibility and effectiveness of alternative polices are evaluated with a particular focus on motivating job creations.

4.1 Allocative Efficiency during the Recession

Analyzing firm dynamics throughout the recession provide indirect insights into the restrictiveness of the regulatory environment. Hopenhayn and Rogerson (1993), for instance, show that taxes on dismissals reduce aggregate labor productivity as well as long-run employment by preventing firm exit and by suppressing the creation. Caballero and Hammour (1996) argue that policies that are overly protective of existing jobs may hinder the pace of renovation and cause technological sclerosis. Bergoeing et al. (2004) find that policies that distort the process of firm birth, growth and death, and the reallocation of resources across producers can retard the recovery from an economic downturn.

Figure 4 displays the firm-level employment-weighted entry and exit rates at the 1-digit sector-level. The exit rate is the ratio of the total number of employees of the firms in their last period to the sector total. The entry rate is the employment share of the firms in their first years. In all the seven sectors, the entry rate follows an overall decreasing pattern. The entry rate reaches its minimum in 2008 with a one-year fall in all sectors simultaneously. The exit rates, however, fluctuate around a rather flat line in all sectors except manufacturing where the mean of the firm-level exit rate is noticeably higher before 2002. In 2008, the exit rates have a peak in all the sectors which lasted only one year. The rise in the exit rate is the sharpest in the administrative activities in which the average exit rate is below 0.5 percent but rises to 1.5 percent in 2008. The exit rates are on average the highest in the accommodation and food services that is around 2 percent annually and the second highest in the trade sector with approximately 1 percent on average. Figure 4 shows that the entry rates are higher than the exit rates during the initial years of the sample period. After 2002, the exit rates tend to be higher than the entry rates in most of the sectors. The wedge between exit and entry rates is particularly large in the second half of the sample in the accommodation and food services, trade and manufacturing sectors, which is mainly driven by the fall in the entry rates.

Figure 4: Firm-Level Entry and Exit Rates



In an economy hit by recession, it is no surprise to observe an increase in the firm exit rates. Whether the increase in the exit rates is due to excessive destruction of production units or a result of the cleansing effect of recession or creative destruction, one needs to introduces productivity at the micro-level into the analysis. Using firm-level data

enables to decompose aggregate productivity and observe how establishments react to productivity shocks.

Baily et al. (2001) method (BBH) decomposes aggregate productivity growth into four components that are within, between, entry and exit.

$$\Delta\theta_t = \underbrace{\sum_{i\in C} \tilde{s}_i \Delta\theta_{it}}_{within} + \underbrace{\sum_{i\in C} \Delta s_{it} \left(\tilde{\theta}_i - \tilde{\theta}\right)}_{between} + \underbrace{\sum_{i\in E} s_{it} \left(\theta_{it} - \tilde{\theta}\right)}_{entry} - \underbrace{\sum_{i\in X} s_{it-k} \left(\theta_{it-k} - \tilde{\theta}\right)}_{exit} \quad (1)$$

In equation 1, $\Delta\theta_t = \theta_t - \theta_{t-k}$ is the log differenced productivity, $\theta_t = \sum_i^N s_{it}\theta_{it}$ is the weighted average of the log of productivity, s_{it} is firm i's labor share and $\tilde{\theta} = (\theta_t + \theta_{t-k})/2$. C, E and X are the sets of incumbent, entrant and exiting firms respectively.

The BBH method decomposes the k-yearly growth in aggregate productivity into four components. The within component represents productivity gains or losses due to firms' own productivity performance holding their market share constant. The between component measures productivity gains or losses due to the reallocation of production factors among producers holding their productivity fixed. There would be a rise in aggregate productivity, for instance, when a firm's productivity increases, or alternatively when a high-productivity firm expands its market share holding the sector averages constant. The within component, therefore, measures the change in the former way of generating productivity gains, while the between component is the measure of the change in the latter. The entry and exit components quantify aggregate productivity gains from entrant and exiting establishments.

Figure 5: BBH Decomposition

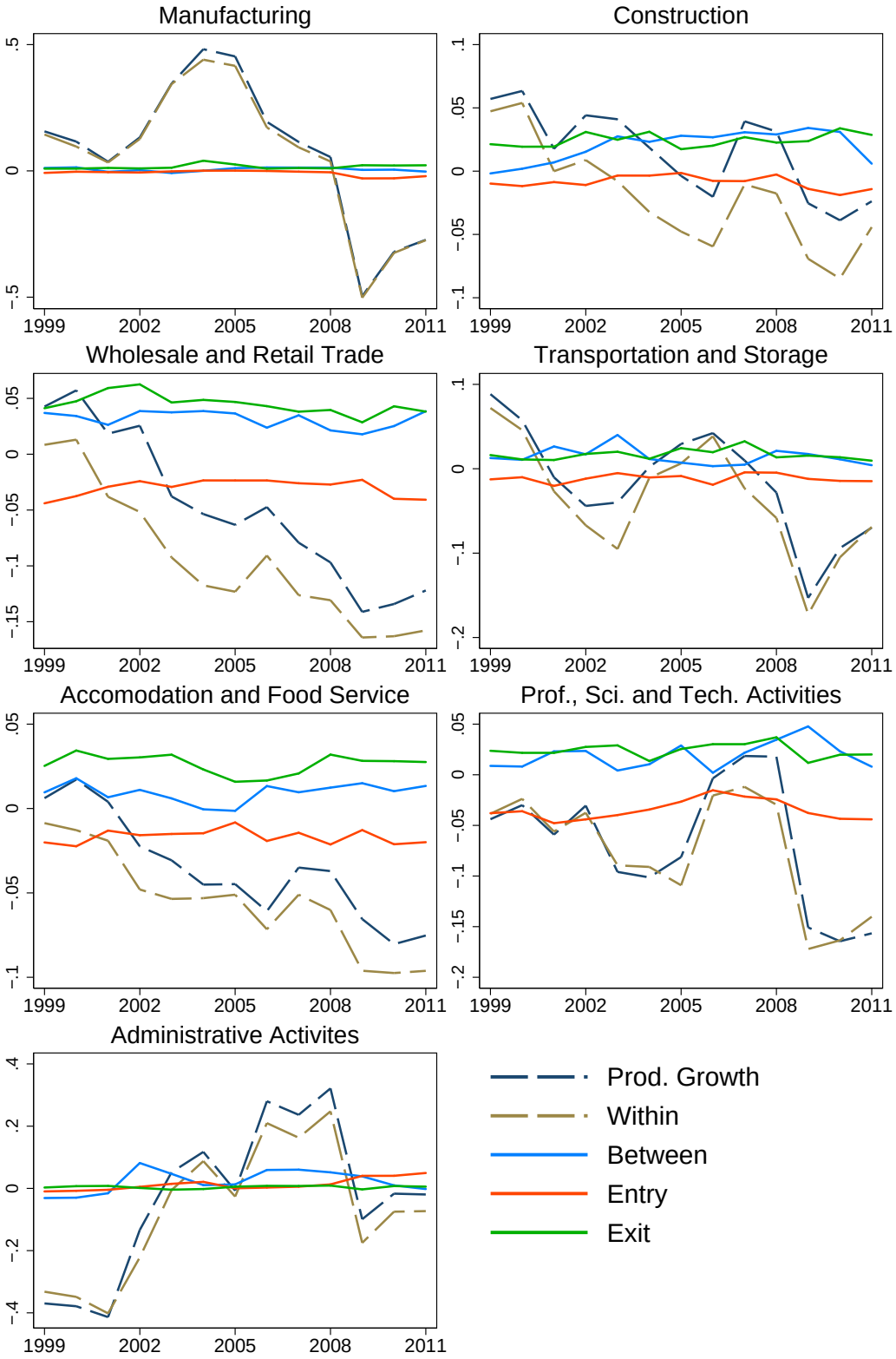


Figure 5 displays the results of the BBH decomposition for the seven 1-digit industries. The components are first computed for each 2-digit industry and every 3-year period and then are weighted-averaged over industries to reach the sector aggregates. The figure shows that the 3-yearly labor productivity growth is negative after 2008 for all the sectors.

On average, the within component is the largest in absolute value and is responsible for the aggregate productivity slowdown after the crisis. The within component reflects the aggregate productivity changes due to firms' individual productivity performance holding their shares constant. Figure 5, therefore, reveals that a large portion of firms receive negative productivity shocks in every sector during the recession.

An industry may respond to a negative shock in different ways, for instance by reallocating its resources from establishments experiencing severe downturns in their productivity performance toward firms that are less affected from the crisis. If this is the case, the between component would indicate a positive contribution to aggregate productivity. Alternatively, the market selection mechanism may drive low-productivity firms out of the market, which would raise the exit component. Moreover, the resource and market share released from shrinking or exiting low-productivity establishments may be captured by new and potentially more productive producers, which would raise the entry component.

In Figure 5, the panel for the manufacturing sector shows that the between, entry and exit components are close to zero throughout the recession regardless of the sharp decrease in labor productivity growth. In the service sectors, however, the productivity slowdown is milder, but the components of the BBH display similar patterns. The entry component reflects a non-positive productivity contribution in almost all sectors except the administrative activities where the entry component is slightly above zero in a few years. This indicates that the post-entry productivity performance within the first 3 years of an entrant firm is generally lower than the industry average.[5] The exit component reflects a positive contribution to aggregate productivity in most of the service sectors. In particular, in the wholesale and retail trade sector, the exit component accounts for roughly one fourth of the absolute value of productivity growth in the post-recession period. The exit component also has a relatively large share in productivity growth and increases after 2008 in the accommodation and food service sector.

Besides regulatory costs, firms' exit decisions are subject to natural barriers inherent of the production process. Exiting establishments enter into a liquidation phase that is more complex for manufacturing firms, since they are generally more capital intensive than the service producing firms. The value of the physical capital within a firm is higher than its outside value, which increases the perceived costs of exit for manufacturing firms relative to service producers. Therefore, it is no surprise that the employment-weighted exit rates are the lowest in the manufacturing sector which is around 0.1 percent in the second half of the sample period. Moreover, relying heavily on less variable factors of production such as capital may decrease firms' flexibility to respond negative shocks which can explain to some degree the difference between the BBH decomposition results for manufacturing and service sectors shown in Figure 4.

When the exit component is positive and large during a recession, this means relatively low-productivity firms exit the market which indicates the recession generates some degree of cleansing effect. The cleansing effect may occur within a firms rather than the exit of the entire establishment, which would cause more number of job destructions. In this case, the between component raises which indicates allocative efficiency gains, since less successful producers' labor share shrink in the market. In the three services sectors that are the wholesale and retail trade, the accommodation and food services and the professional, scientific and technical activities, the between component reflects positive

[5]The calculation of the entrants' contribution to aggregate productivity is sensitive to the selection of the time interval, so that a wider interval would lead to a larger entry contribution.

contribution to the productivity growth during and after the economic crisis. In particular, the between component exhibits a peek in 2009 in the professional, scientific and technical activities sector. This can be considered as an important insight since labor mobility is possibly less restricted by the employment protection legislation in the professional, scientific and technical activities. This is because some categories of workers such as scientists and artists are exempt from the legislative restrictions on the duration and renewal of fixed-term contracts, so that the establishments in this sector can have labor composition subject to more flexible contracts. As a results, firms may find it optimal to displace some employees rather than shutdown the entire business, which leads to a fall in the exit component, while the between component rises. Alternatively, the between component may rise due to the expansion of more productive firms, holding the less productive establishments' size constant. If this is the case, one would observe higher rates of job creation rather than destruction, which is less likely to happen in the recession times. An analysis of job creation and destruction dynamics during and after the crisis would complete the picture of how the sectors' responses to the external shock. The next section focuses on the job creation and destruction dynamics.

The BBH decomposition shows that in some service sectors, the between and exit components reflect positive contributions to aggregate productivity in the recession period. Even in the service sectors with the highest exit rates, however, the exit or between components are not high enough to balance the fall in the within component, and the productivity growth is negative for all the sectors throughout the post-recession period. Sound market selection mechanism also motivates firm entry, in the absence of which the economy can be locked in technological sclerosis. Figure 5 displays that entrants' contribution to aggregate productivity is negative in all the sectors.

Figure 6: Initial Size of Entrants

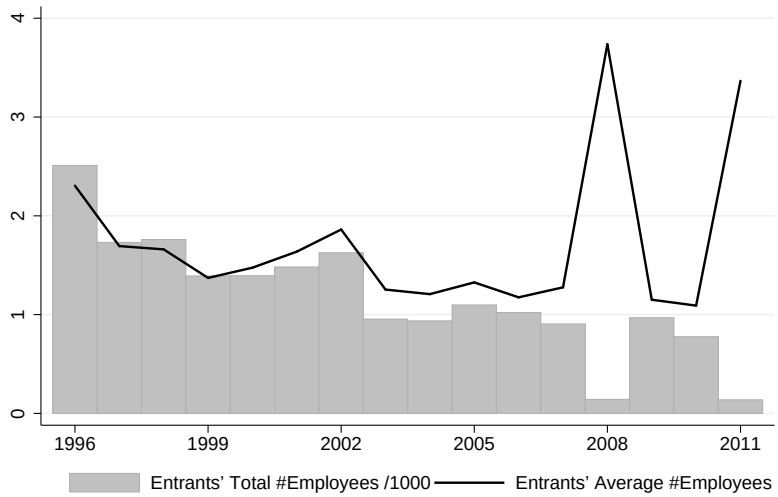


Figure 6 depicts the total and average number of employees of entrant firms in the year of entry. Entrants' total employment follows a decreasing pattern where in two years, 2008 and 2011, the entry rate is almost zero. Entrants' average number of employees has a peak in the years corresponding to the two economic crises in 2002 and 2008, but it is also high in 2011. This shows that the entry threshold is high in the concerning years, so that only very few number of firms are able to enter into the market with a relatively large sizes.

Figure 7: Post-Entry Performance

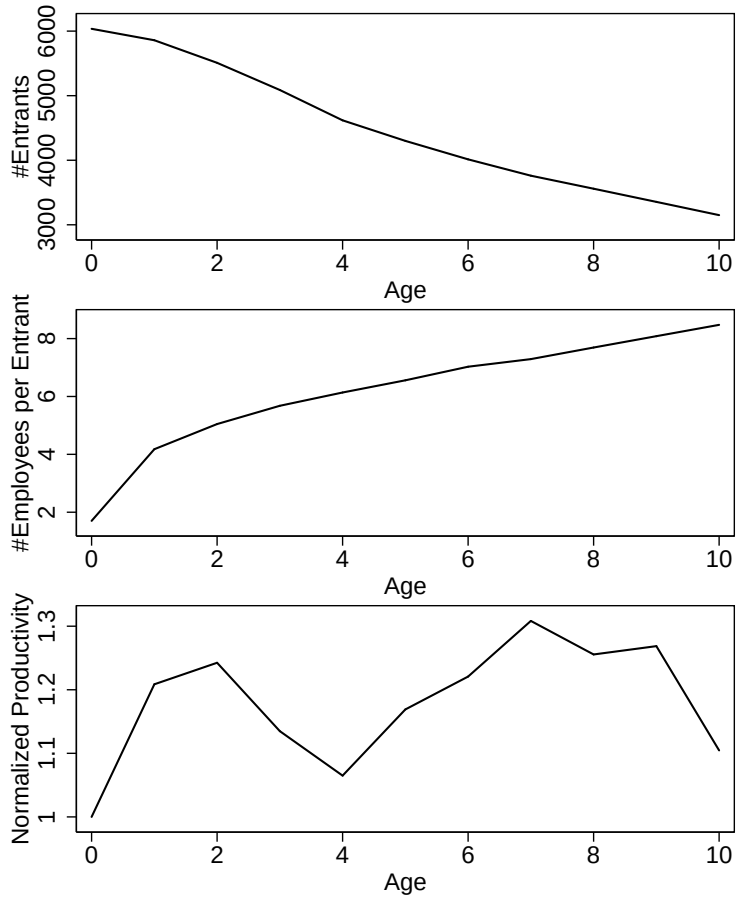


Figure 7 displays the post-entry survival, growth and productivity performance of entrant firms. The figure is based on a restricted sample of entrants that were born before 2003, so that I can observe every firm's first 10 years in the market. The top panel shows the time paths of the number of surviving entrants for the 10-year startup period. Accordingly, around half of the entrant firms exit the market within their first ten years, while around 25 percent of it exited within the first 4-year period. Comparing the survival rates with other studies (e.g. Bartelsman et al., 2004), the survival rate of entrants are not significantly low in Luxembourg. The main difference of Luxembourg's entrants, however, is in their growth performances. The middle panel of Figure 7 shows that entrants initially have on average 2 employees while it rises to 8 at the end of the 10-year startup period. In manufacturing industries, entrant firms' initial growth performances can be low. This is because the initial size of manufacturing firms is generally large, and they tend to cover their sunk cost of entry rather than expanding during the startup period. In service sectors, however, firms can grow more rapidly. For instance, Bartelsman et al. (2004) shows the service producing entrants can grow 30 to 50 times larger than their initial size within 7 years not only in large but also in smaller economies such as Slovenia, Latvia and Estonia. In Luxembourg's manufacturing, construction and private non-financial service sectors, entrants' initial size and the size at the end of the startup period is relatively small. The bottom panel shows the time path of entrants' labor productivity relative to their entry year. Accordingly, the average entrant experiences around 20 percent productivity growth within its first two years in the market. The average labor productivity of entrant firms, however, does not significantly increase after

the initial 2-year period. Entrant's average productivity 10 years after the entry time is even lower than the average productivity at the age of 2. This is mainly because an important portion of entrants that can survive up to the age of 10 hit by the 2008's global recession by the end of their startup period.

5 Drivers of Job Creation and Destruction

The analysis in this section makes use of job creation and destruction rates at the firm and sector-level that are calculated based on Davis et al. (1996). $g_{it} = 2\left(l_{it} - l_{it-1}\right) / \left(l_{it} + l_{it-1}\right)$ representing the job growth rate and $s_{it} = \left(l_{it} + l_{it-1}\right) / \left(L_t + L_{t-1}\right)$ being firms' employment share in the sector, the job creation (JCR) and destruction rates (JDR) are computed as follows.

$$JCR_t = \sum_i s_{it} \max\left\{0, g_{it}\right\} \quad , \quad JDR_t = \sum_i s_{it} |\min\left\{0, g_{it}\right\}| \tag{2}$$

While calculating a sector's JCR and JDR, the start-up level of employment of an entrant firm is considered as newly created jobs, and the employment level of an exiter in the exit year is considered as job destructions. Figure 8 reports the sector-level JCR and JDR including the employment turnover by firm entry and exits. In the appendix, Figure 9 presents the time paths of JCR and JDR excluding the job creation or destructions by entrant and exiting establishments. The job creation and destruction rates are slightly higher when entrants and exiters are taken into account, but the time paths are quite similar in every sector.

Figure 8: Job Creation and Destruction with Entry and Exit (%)

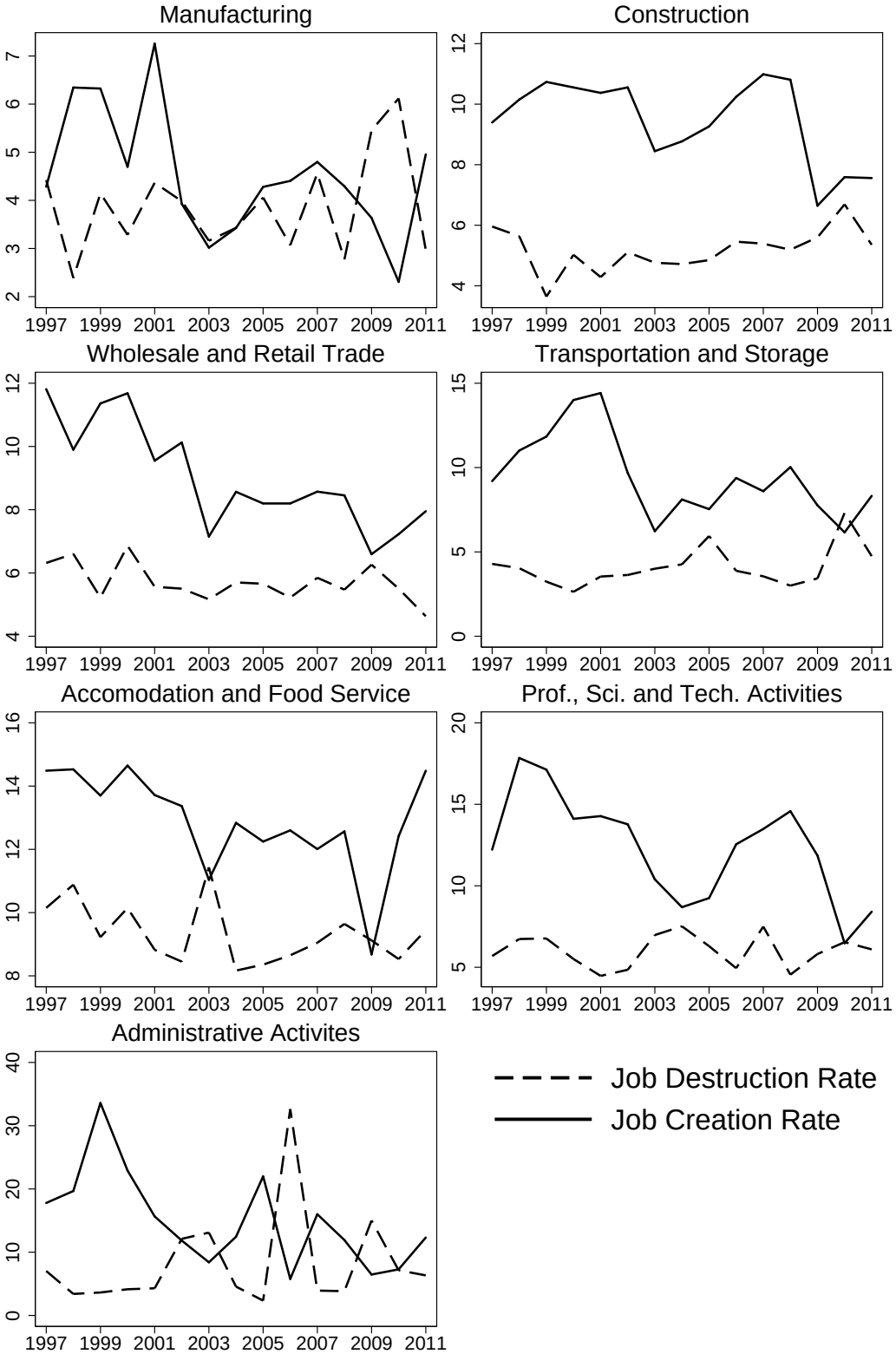


Figure 8 shows that the JCR exhibits a fall in 2009 in all the sectors simultaneously. The decrease in the job creation is particularly sharp in the manufacturing, construction, accommodation and food services and professional, scientific and technical activities sectors. Moreover, the fall in the JCR is not recovered within the sample period in the

construction, and the professional, scientific and technical activities. Comparing the two periods before and after the first crisis in 2002, the average annual JCR is lower in the latter period. This indicates that the rapid expansion period comes to an end in the second half, and the job creation rates are at the minimum during the last 3-year period of the sample.

Figure 8 shows that the JCR and JDR decouples during the recession. The decoupling of creation and destruction is mainly due to the fall in the JCR, but in sectors such as manufacturing and administrative activities the JDR also rises after 2008. The JDR, however, turned back to its pre-crisis level by the end of the sample period and is more stable over time in most of the sectors. In the largest 1-digit sector that is the wholesale and retail trade, there is a clear downward trend in the job creation throughout the sample period, while the JDR barely fluctuates around a constant mean of 6 percent.

In a frictionless labor market, recessions generate increased reallocation where an increase in job destruction is followed by creation of new jobs. Caballero and Hammour (1996) argue that when there is heavy regulations to protect jobs, recessions may suppress job creation. Caballero and Hammour suggest that the decoupling of job creation and destruction calls for policy actions to stimulate job creation which would speed up the post-crisis recovery and avoid the economy caught in the trap of technological sclerosis and long-run unemployment.

The empirical results obtained in this section demonstrate that Caballero and Hammour's predictions are particularly relevant in the context of Luxembourg. The efficiency in the allocation of labor is distorted in most sectors and job creation rates are stably low during and after the recession. Comparing with other countries, there is also some evidence that the existing regulations are strict and potentially restrict labor mobility in the expense of preventing job losses. Relaxing the employment protection legislation, therefore, can be a policy option, since unemployment levels are not dramatically high in Luxembourg. Relaxing the protections, however, may not be sufficient alone to accelerate the post-crisis recovery in recession times. In the short-term, lowering the barriers to labor mobility may not directly accelerate factor reallocation or creative destruction but only increase job destruction. Generating additional incentives to create of new jobs, therefore, would be useful to activate the recovery mechanism and complement the reforming of the employment protection legislation. Policy practices aiming at higher job creation rates involve removing the barriers to development of dynamic type establishments with higher job creation potential, for instance, by facilitating their access to external finance, offering tax reductions or promoting exporting activities. Which companies should be targeted to motivate job creation, however, has been the subject of a continuing debate among applied researchers.

Although there is limited empirical support, smaller firms are believed to contribute more into job creation. Birch (1981) shows that during 1970's, more than half of the jobs in the U.S. are created by firms with less than 20 employees. Neumark et al. (2011) suggest that Birch's arguments strengthened the position of the U.S. authorities who follow a long tradition of supporting small businesses. They also provide empirical evidence supporting the negative link between firm size and job creation. On the contrary, Davis et al. (1996) find that firm size is not a significant determinant of job creation and argue that Birch's results suffer from misleading interpretation of the data.

Empirical studies estimating the relation between job creation and firm size may encounter the problem of the regression fallacy, because a firm that experiences a negative (positive) transitory shock is more likely to grow (shrink) soon after the impact of the

shock vanishes. Davis et al. (1996) suggest a size classification methodology that takes the average of the current and previous periods' employment as benchmark. Using this methodology, Haltiwanger et al. (2013) show that when firm age is controlled for, there is no significant variation in job creation rates among different firm size groups. Criscuolo et al. (2014) provide cross-country empirical support that not all small businesses but young businesses which are usually small create a disproportionate number of jobs.

This section follows the methodology by Davis et al. (1996), so that firms are classified into size groups according to the average of the last two years' employment level. I regress the firm-level gross job creation, destruction and net job creation rates on firm size as well as age dummies. I estimate three equations where the dependent variable of the first is the firm-level JDR that is $|\min\{0, g_{it}s_{it}\}|$. The dependent variable of the second equation is the $JCR = |\max\{0, g_{it}s_{it}\}|$ where $g_{it}s_{it} = 2(l_{it} - l_{it-1})/(L_{it} + L_{it-1})$. The dependent variable of the third estimating equation is the firm-level net job creation $NJDR$ that is the difference between the dependent variables of te first two equations. The dependent variables of the regression analysis are weighted by firms' labor share, since otherwise an increase in a small firm's employment from 1 to 3 would be considered as a larger contribution to employment growth than a large firm that doubles its number of employees. Whether the employment level of entrant and exiting firms are considered as job creation and destructions has a critical importance for the results of the regression analysis. Considering entrants' initial employment as job creations, for instance, raises young firms' contribution to the overall job creation. Moreover, exiting establishments tend to shrink in size during the liquidation process, so that exiters are often smaller as well as older than the average incumbent, which influence the estimated impact of size and age on the JDR. Thus, I estimated two sets of equations where the first set is based on a sample that excludes entrant and exiting establishments. The second set is estimated for the full sample including entrant and exiters. In some sectors, estimation results show that a firm group has significantly higher contribution to job creation as well as to job destruction. When this is the case, the $NJCR$ estimations are helpful to understand the net contribution to overall employment level. In the appendix, Table 2 presents descriptive statistics on the firm age and size classes, the JCR and JDR within each group and for every sector. In the appendix, Tables 3 to 6 display the estimation results. Table 1 provides an overall summary of the results where $+$ and $-$ represent the positive and negative coefficient estimates that are significant at least at 10 percent level. The blank cells are for the insignificant coefficients. Table 1 reports the estimates based on the full sample including entrant and exiting firms. If a coefficient's sign changes for the estimations based on the restricted sample excluding entrant and exiters, the new coefficient's sign is given in the parenthesis.

Table 1: Summary of Job Creation and Destruction Regressions

	age (≤ 5)	age ($> 5 \leq 10$)	size (≤ 20)	size ($> 20 \leq 100$)	crisis(cr) (> 2007)	cr*age (≤ 5)	cr*age ($> 5 \leq 10$)	cr*size (≤ 20)	cr*size ($> 20 \leq 100$)
Job Destruction									
Manufacturing			−	−					
Construction	−		−	−					
Who. & Retail Trade	−	−	−	−		+			
Transp. and Storage	−( )		−	−					
Accom. and Food Ser.	−( )		−	−		(+)			
Prof. Sci. & Tech. Act.	−( )		−	−		(+)			
Administrative Act.	−		−	−	−			+	+
Job Creation									
Manufacturing	+	+	−	−	−			+	+
Construction	+	+	−	−	−			+	
Who. & Retail Trade	+	+	−	−	−			+	
Transp. and Storage	+	+	−	−	−			+	+
Accom. and Food Ser.	+		−	−		(+)	+		
Prof. Sci. & Tech. Act.	+	+	−	−	−	−	−	+	
Administrative Act.			−	−	−			+	+
Net Job Creation = Job Creation - Job Destruction									
Manufacturing	+	+							
Construction	+	+	−	−					
Who. & Retail Trade	+	+	−	−		−( )			
Transp. and Storage	+		−	−	−			+	
Accom. and Food Ser.	+		−	−			+		
Prof. Sci. & Tech. Act.	+	+	−	−		−			
Administrative Act.	+		−	−	−			+	+

If the coefficient signs change in the estimations based on the sample without entrant and exiters, they are given in parentheses.

In the regression analysis, the estimated coefficients on the age dummies represent the deviation in the JDR, JCR or $NJCR$ contributions of each age group from the benchmark group that is the firms older than 10 years. Similarly, the benchmark group in the size classification is the firms with more than 100 employees. The crisis dummy takes the value of 1 for the four years from 2008 to 2011. The results reveal clear common patterns in the JDR, JCR and $NJCR$ for all the sectors. The following evaluation mainly focuses on these common patterns rather than interpreting the estimation results for each sector separately.

The estimation results for the full sample show that the youngest firm group has lower JDR than the oldest firms in all the sectors except manufacturing. This is somewhat contradicting with findings of previous studies that younger firms are more likely to exit. In Luxembourg, however, the survival rate of entrants is relatively high which is over 70 percent at the end of their first 5 years in the market (see Figure 7). This can be because of large barriers to entry, which is also a possible reason for the low entry rates, so that only few highly efficient producers can enter into the market whose exit probability is lower. Exiting firms are mostly contained in the group of older firms and raise the older groups' JDR relative to young firms. Indeed, once the sample is cleared from the entrant and exiting firms, the wedge between the JDR of the youngest and oldest firm groups turns out to be insignificant in three sectors. The coefficients for the second age group, $age_{>5,\leq 10}$, are still negative but smaller in absolute value and not significant in most of the sectors.

The coefficients on firm size dummies are significant and negative in all the JDR equations. In the JDR regressions, the coefficients of size dummies are larger, in absolute value, than those of age dummies. Moreover, the coefficients for the smallest firm group are larger than those for the middle-sized firms. Comparing the JDR estimation results based on the restricted and full samples, the coefficients on size classes do not differ significantly. This is probably because the exiting firms are distributed rather equally among the firm size groups, so that excluding the exiters does not significantly alter a size group's JDR relative to the others.

The crisis dummy, which takes the value of 1 for years after 2007, is introduced into the JDR equations to obtain some insights to whether the crisis was cleansing or not.[6] In the JDR regressions based on the full sample, neither the crisis dummy alone nor the interaction terms are significant in most of the sectors. This is consistent with the findings in the previous sections that the cleaning effects generated by the 2008 crisis was not strong enough to balance the slowdown in aggregate productivity. In a dynamic model of heterogeneous firms with no factor adjustment costs, the job creation would ideally rise after recession that clears the market from inefficient units. The results of the JCR estimations, however, indicate a fall in job creation in the post recession period.

The middle panel of Table 1 shows the summary of the estimation results based on the JCR equations. The estimation results support the findings of Haltiwanger et al. (2013), so that the youngest firm group has significantly larger contribution to job creation. The coefficients on $age_{>5,\leq 10}$ are lower than those of $age_{\leq 5}$ but are also positive and significant in most of the sectors. The coefficients of the two size dummies for small and medium-sized firms are significantly negative in all sectors. The largest from group, therefore, has a better job creation performance in comparison to the smaller ones.

Unlike in the JDR equations, the crisis dummy has a significantly negative coefficient

[6] Alternatively, I introduce a crisis dummy only for the three years after 2008 in which case I obtained a lower number of significant estimates, but the overall results do not change.

estimate in the JCR equations for every sector except the accommodation and food services. The interaction term between the crisis dummy and the age dummies are mostly insignificant showing that the impact of the crisis on job creation does not differ for alternative age groups. The coefficients on the interaction terms involving size dummies, however, are mostly significant and positive. This is mainly because of the slowdown in the job creation performance of the largest firm group during the recession, which reduces the JCR gap between the large and small firms. The JCR estimation results are barely different for the restricted and full sample. This is because the overall entry rates are low in Luxembourg, so that excluding the entrants does not really influence the coefficient estimates.

Table 1 shows that small firms have lower contribution to the job creation as well as job destruction in comparison to the large firms. The $NJCR$ estimation results given in the bottom panel accounts for firms' net job creation contribution which would, for instance, clarify whether small or large firms' net job creation is higher. According to the $NJCR$ estimations, the youngest firm group has the highest contribution to job creation among all the age groups in every sector. The smallest firms, however, have significantly lower job creation in all the sectors except manufacturing. The crisis dummy has a significant coefficient estimate in the transportation and storage and the administrative activities, while interaction term for the youngest firm group is significantly negative in the trade and the professional scientific and technical activities. The results, therefore, provide some evidence that the crisis had a negative effect on the youngest firms' relative job creation performance especially in the wholesale and retail trade that is the largest sector of the sample. The largest firms' relative contribution to the $NJCR$ is negatively affected by the recession in the transportation and storage and the administrative activities.

Overall, Table 1 shows that the recession actually altered firms' job creation rather than job destruction in Luxembourg. Combining this with the fact that labor protection regulations are considerably strict in Luxembourg relative to other OECD member states, excessive regulations can be one reason behind the unresponsiveness of the economy to the external shock and the slow recovery in productivity. The estimation results further indicate that both firm size and age have some explanatory powers on the job creation and destruction dynamics. The small and medium-sized establishments, however, are found to have smaller contribution to net job creation. On the contrary, the largest firms as well as the youngest establishments create a disproportionate number of jobs. There is also some evidence that in some sectors, the youngest firms' net job creation performance is asymmetrically affected by the recession.

6 Conclusions and Implications for Economic Policy

Dynamic economies the ones that are able to adapt to the changing conditions more quickly, for instance, by reallocating their resources towards more successful uses. A key channel through which the reallocation-driven microeconomic restructuring takes place is the Schumpeterian creative destruction that is the dynamic process of replacing the old by the new. Creative destruction, however, involves the exit of production units and losses of jobs that are often encountered by the political opposition, in most cases, in the form of more stringent employment protections. Incentives to impose stricter employment protections rise during recession times that is when the economy vitally needs its dynamism to accommodate to the new business environment. On the contrary,

economic recessions can also cause large-scale and long-lasting unemployment especially in the presence of chronic labor market deficiencies. The recession periods, therefore, entail economic policies that can effectively fight against long-run unemployment but do not interrupt creative destruction in exchange for preventing future job losses.

The results of this paper call attention for the sluggish post-crisis recovery which necessitates reforms toward facilitating factor reallocation and creative destruction. The efficiency in the labor allocation is deteriorated, so that relaxing the strict employment protection legislation should be given more importance in the policy agenda. In addition to distorting reallocation mechanism, labor market inefficiencies may cause persistent unemployment. To avoid the economy stuck in a high-unemployment low-productivity trap, policies to encourage the entry and development of young establishments are prerequisite. This can be achieved in different ways, for instance, by relaxing legal obligations to start-up a business, by easing the access to finance or by providing tax incentives to enter into international markets for younger firms, where finding the most effective set of policy tools is out of the scope of this paper.

This study finds that young establishments create a disproportionate number of jobs in Luxembourg. This supports the view that not small but young firms constitute the dynamic part of market economies (e.g. Decker et al. 2014). Young firms, however, are also more fragile than their older counter parts (e.g. Fort et al., 2013). Besides encouraging job creation, economic policies favoring young firms during recessions would be helpful to keep the dynamic part of the economy alive. This would increase the ability of the economy to cope with external shocks which would otherwise cause long-lasting adverse impact on aggregate productivity growth.

6.1 Concluding Remarks

This paper investigates the impact of the 2008 global economic crisis on the production dynamics in Luxembourg and finds a significant slowdown in aggregate labor productivity growth. Establishments experiencing negative productivity shocks keep up their pre-crisis employment shares but rely more on intermediate inputs in production. At the aggregate-level, the recession generates labor hoarding effects, and the aggregate labor productivity falls dramatically thereafter. The long-lasting productivity slowdown attracts the attention to the factors holding back the recovery.

The negative impact of the global crisis on firms' productivity did not activate the cleansing effects that would otherwise force inefficient producers to exit the market and counteract the slowdown in aggregate productivity. The response of the sector to the negative shock is a fall in the firm-level entry and job creation, while job destruction seems to be not significantly altered by the crisis. Consequently, there are no noticeable allocative efficiency gains and the aggregate productivity growth is negative throughout the entire post-crisis period. The findings call further attention to factors restricting labor mobility such as the employment protection legislation that is particularly strict in Luxembourg.

This study provides evidence that not small and medium-sized, but large firms have higher contribution to job creation in Luxembourg. The young firms also create a disproportionate number of jobs but are more prone to recessions, so that not only the job creation of young firms but also the creation of new firms diminished during the crisis. This shows that the regulatory burden imposed at the expense of protecting employment can be effective enough to suppress job destruction in the short term. In the long run,

however, strict regulations on factor mobility impedes creative destruction by raising the cost of exit for inefficient units. This in turn restrains the entry of new firms that are expected to be the engine of job creation and to be the potential driving force of the post-crisis recovery.

The breakdown of the factor reallocation mechanism causes resources to be employed in less productive uses, which pulls down aggregate productivity. The aggregate productivity slowdown can be recovered, for instance, by enhancing firms' individual productivity performance or by facilitating the reallocation of inputs from less to more productive incumbents. Improving firms' individual productivity may not be easily achieved in the short term by economic policy tools due to the random nature of innovations. The reallocation towards more efficient units, however, can be influenced by the economic policy. In addition to direct obstacles to factor mobility such as the strict employment protection legislation, excessive regulation on firms' operational activities and barriers to entry and exit may hinder resource reallocation and urge the need for further policy reforms.

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7 Appendix

Table 2: Description of Firm Size and Age Classes[a]

	SIZE CLASSES			AGE CLASSES			SIZE CLASSES			AGE CLASSES		
	[0,20]	(20,100]	> 100	[0,5]	(5,10]	> 10	[0,20]	(20,100]	> 100	[0,5]	(5,10]	> 10
	MANUFACTURING						ACCOMMODATION AND FOOD SERVICES					
#firms	540	134	52	152	143	431	2163	68	10	778	569	893
age	15	22	45	4	8	43	12	16	24	3	8	22
#emp.	6	44	490	11	20	71	4	35	277	4	5	9
JCR	1.2	1.3	2.1	1.2	0.7	2.6	10.5	1.3	1.0	6.7	2.2	4.0
JDR	0.8	0.8	2.2	0.3	0.4	3.2	8.1	0.8	0.4	2.5	2.5	4.3
Share	10	17	73	5	8	87	64	17	20	21	21	58
	CONSTRUCTION						PROF., SCI. AND TECH. ACTIVITIES					
#firms	1794	319	54	674	524	969	2321	98	20	828	662	948
age	11	18	24	4	8	23	12	19	30	3	8	27
#emp.	6	40	191	7	12	24	4	40	323	3	6	13
JCR	5.5	2.7	1.2	4.1	1.7	3.6	7.4	1.9	3.0	4.9	2.5	4.9
JDR	2.8	1.6	0.7	0.9	1.2	3.1	3.6	1.0	1.4	1.1	1.4	3.6
Share	32	37	30	13	18	69	46	20	34	14	20	66
	WHOLESALE AND RETAIL TRADE						ADMINISTRATIVE ACTIVITIES					
#firms	4599	258	41	1413	1148	2336	596	55	37	250	182	256
age	15	25	31	3	8	28	13	13	21	4	8	25
#emp.	4	41	280	4	6	12	4	50	458	10	27	59
JCR	5.8	1.8	1.4	3.7	1.5	3.8	2.1	2.5	10.3	4.1	3.9	6.9
JDR	4.1	1.1	0.5	0.8	1.2	3.7	1.0	1.3	5.9	1.1	2.0	5.2
Share	47	26	28	13	16	71	11	12	77	11	20	68
	TRANSPORTATION AND STORAGE											
#firms	622	114	27	249	194	320						
age	11	15	42	4	8	37						
#emp.	5	44	428	7	13	48						
JCR	3.7	3.1	2.7	3.3	1.7	4.5						
JDR	1.8	1.4	0.9	0.6	1.0	2.5						
Share	17	26	58	8	13	78						

[a]Age and #emp. are firms' average age and number of employees in each group. #firms is the average annual number of firms in a group. Each group's average employment share in the sector total (Share), job creation (JCR) and destruction rates (JDR) are in percentages.

Figure 9: Job Creation and Destruction without Entry and Exit (%)

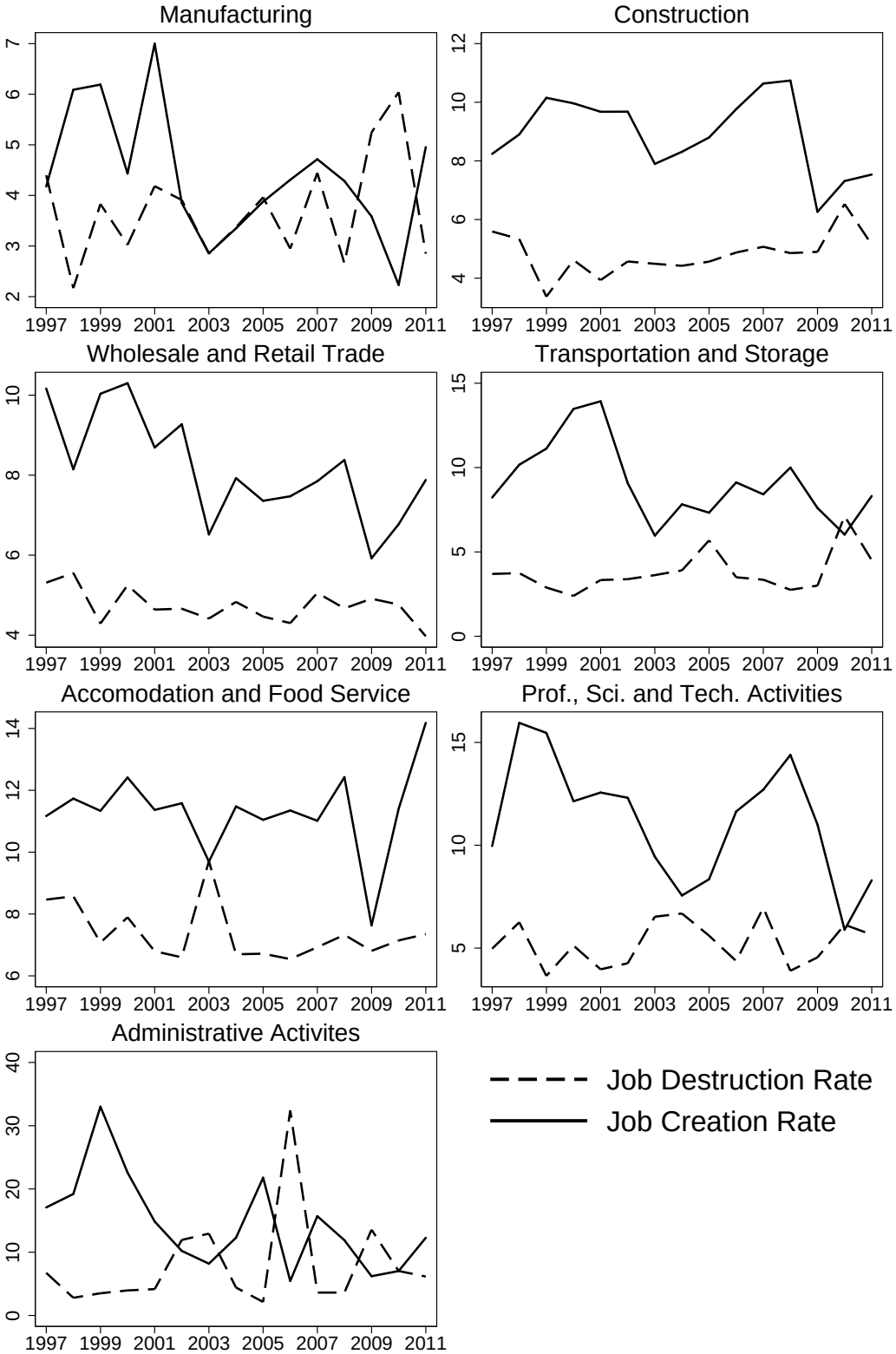

Table 3: Job Creation and Destruction Regressions (1) [a]

	Without Entry&Exit			With Entry&Exit		
	JDR	JCR	NJCR	JDR	JCR	NJCR
Manufacturing						
$age_{\leq 5}$	-0.0011	0.0070***	0.0081***	-0.0016	0.0068***	0.0083***
	(0.0011)	(0.0009)	(0.0012)	(0.0010)	(0.0008)	(0.0012)
$age_{>5,\leq 10}$	-0.0013	0.0038**	0.0051***	-0.0013	0.0037**	0.0050***
	(0.0010)	(0.0016)	(0.0019)	(0.0010)	(0.0016)	(0.0019)
$size_{\leq 20}$	-0.0317***	-0.0422***	-0.0104	-0.0316***	-0.0424***	-0.0108
	(0.0074)	(0.0065)	(0.0095)	(0.0075)	(0.0065)	(0.0095)
$size_{>20,\leq 100}$	-0.0285***	-0.0343***	-0.0058	-0.0286***	-0.0341***	-0.0055
	(0.0080)	(0.0064)	(0.0097)	(0.0081)	(0.0065)	(0.0098)
crisis (cr)	0.0015	-0.0140*	-0.0154	0.0048	-0.0166**	-0.0214
	(0.0075)	(0.0076)	(0.0129)	(0.0091)	(0.0079)	(0.0147)
$age_{\leq 5}$*cr	-0.0004	-0.0022	-0.0017	-0.0003	-0.0020	-0.0018
	(0.0010)	(0.0016)	(0.0019)	(0.0009)	(0.0015)	(0.0018)
$age_{>5,\leq 10}$*cr	-0.0001	-0.0010	-0.0009	-0.0001	-0.0010	-0.0009
	(0.0011)	(0.0020)	(0.0024)	(0.0012)	(0.0020)	(0.0024)
$size_{\leq 20}$*cr	-0.0056	0.0168**	0.0223	-0.0057	0.0168**	0.0225
	(0.0096)	(0.0076)	(0.0143)	(0.0096)	(0.0076)	(0.0143)
$size_{>20,\leq 100}$*cr	-0.0057	0.0147**	0.0204	-0.0058	0.0144*	0.0202
	(0.0094)	(0.0074)	(0.0141)	(0.0093)	(0.0075)	(0.0141)
R^2 / #obs	0.08/10290	0.12/10290	0.04/10290	0.08/10894	0.12/10894	0.04/10894
Construction						
$age_{\leq 5}$	-0.0003*	0.0047***	0.0049***	-0.0007***	0.0045***	0.0051***
	(0.0002)	(0.0003)	(0.0003)	(0.0001)	(0.0002)	(0.0002)
$age_{>5,\leq 10}$	0.0000	0.0012***	0.0012***	-0.0001	0.0012***	0.0013***
	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0003)
$size_{\leq 20}$	-0.0113***	-0.0231***	-0.0118***	-0.0111***	-0.0232***	-0.0121***
	(0.0021)	(0.0019)	(0.0027)	(0.0021)	(0.0019)	(0.0027)
$size_{>20,\leq 100}$	-0.0079***	-0.0155***	-0.0076***	-0.0078***	-0.0155***	-0.0077***
	(0.0021)	(0.0019)	(0.0027)	(0.0021)	(0.0019)	(0.0027)
crisis (cr)	-0.0008	-0.0068**	-0.0060	-0.0006	-0.0071***	-0.0065
	(0.0031)	(0.0027)	(0.0044)	(0.0031)	(0.0027)	(0.0044)
$age_{\leq 5}$*cr	-0.0002	-0.0006	-0.0003	-0.0001	-0.0005	-0.0005
	(0.0002)	(0.0004)	(0.0005)	(0.0002)	(0.0004)	(0.0004)
$age_{>5,\leq 10}$*cr	-0.0001	-0.0004	-0.0003	-0.0001	-0.0004	-0.0003
	(0.0003)	(0.0002)	(0.0004)	(0.0003)	(0.0002)	(0.0004)
$size_{\leq 20}$*cr	-0.0007	0.0058**	0.0065	-0.0007	0.0058**	0.0065
	(0.0031)	(0.0027)	(0.0045)	(0.0032)	(0.0027)	(0.0045)
$size_{>20,\leq 100}$*cr	-0.0006	0.0032	0.0039	-0.0008	0.0032	0.0040
	(0.0032)	(0.0028)	(0.0045)	(0.0032)	(0.0028)	(0.0045)
R^2 / #obs	0.05/30244	0.12/30244	0.03/30244	0.05/32507	0.12/32507	0.03/32507

[a]Benchmark groups are firms over 10 years old and with over 100 employees. Clustered robust standard errors are in parentheses. 2-digit industry and time dummies are included in all equations. *** significant at 1%. ** significant at 5%. * significant at 10%.

Table 4: Job Creation and Destruction Regressions (2) [a]

	Without Entry&Exit			With Entry&Exit		
	JDR	JCR	NJCR	JDR	JCR	NJCR
Wholesale and Retail Trade						
$age_{\leq 5}$	-0.0004***	0.0016***	0.0020***	-0.0006***	0.0018***	0.0024***
	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
$age_{>5,\leq 10}$	-0.0001**	0.0004***	0.0005***	-0.0002***	0.0004***	0.0006***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$size_{\leq 20}$	-0.0116***	-0.0370***	-0.0254***	-0.0114***	-0.0371***	-0.0256***
	(0.0036)	(0.0090)	(0.0096)	(0.0036)	(0.0090)	(0.0096)
$size_{>20,\leq 100}$	-0.0083**	-0.0305***	-0.0222**	-0.0079**	-0.0304***	-0.0225**
	(0.0036)	(0.0089)	(0.0096)	(0.0036)	(0.0089)	(0.0096)
crisis (cr)	-0.0016	-0.0142*	-0.0126	-0.0016	-0.0148*	-0.0132
	(0.0047)	(0.0084)	(0.0098)	(0.0047)	(0.0085)	(0.0099)
$age_{\leq 5}$*cr	0.0001*	-0.0000	-0.0001	0.0002***	-0.0002	-0.0004*
	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
$age_{>5,\leq 10}$*cr	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
$size_{\leq 20}$*cr	0.0013	0.0140*	0.0127	0.0013	0.0140*	0.0127
	(0.0047)	(0.0084)	(0.0098)	(0.0047)	(0.0084)	(0.0098)
$size_{>20,\leq 100}$*cr	0.0008	0.0125	0.0117	0.0007	0.0124	0.0118
	(0.0047)	(0.0084)	(0.0098)	(0.0047)	(0.0084)	(0.0098)
R^2 / #obs	0.05/67760	0.10/67760	0.03/67760	0.04/73465	0.10/73465	0.03/73465
Transportation and Storage						
$age_{\leq 5}$	-0.0011	0.0090***	0.0100***	-0.0017**	0.0085***	0.0102***
	(0.0007)	(0.0015)	(0.0016)	(0.0007)	(0.0014)	(0.0015)
$age_{>5,\leq 10}$	-0.0002	0.0026*	0.0028	-0.0001	0.0026*	0.0028
	(0.0008)	(0.0015)	(0.0018)	(0.0008)	(0.0015)	(0.0018)
$size_{\leq 20}$	-0.0310**	-0.1147***	-0.0837***	-0.0306**	-0.1152***	-0.0846***
	(0.0121)	(0.0205)	(0.0250)	(0.0121)	(0.0209)	(0.0254)
$size_{>20,\leq 100}$	-0.0222*	-0.0852***	-0.0630**	-0.0222*	-0.0856***	-0.0634**
	(0.0122)	(0.0206)	(0.0251)	(0.0121)	(0.0210)	(0.0254)
crisis (cr)	-0.0071	-0.0615***	-0.0545*	-0.0068	-0.0581***	-0.0513*
	(0.0145)	(0.0219)	(0.0304)	(0.0145)	(0.0213)	(0.0299)
$age_{\leq 5}$*cr	-0.0002	-0.0006	-0.0004	0.0000	-0.0007	-0.0007
	(0.0009)	(0.0021)	(0.0022)	(0.0008)	(0.0019)	(0.0021)
$age_{>5,\leq 10}$*cr	0.0005	-0.0023	-0.0028	0.0004	-0.0022	-0.0026
	(0.0013)	(0.0017)	(0.0022)	(0.0012)	(0.0016)	(0.0021)
$size_{\leq 20}$*cr	0.0027	0.0567***	0.0540*	0.0027	0.0567***	0.0540*
	(0.0139)	(0.0199)	(0.0282)	(0.0138)	(0.0200)	(0.0283)
$size_{>20,\leq 100}$*cr	0.0034	0.0425**	0.0391	0.0034	0.0425**	0.0391
	(0.0138)	(0.0198)	(0.0280)	(0.0138)	(0.0199)	(0.0282)
R^2 / #obs	0.06/10493	0.22/10493	0.09/10493	0.06/11456	0.22/11456	0.09/11456

[a]Benchmark groups are firms over 10 years old and with over 100 employees. Clustered robust standard errors are in parentheses. 2-digit industry and time dummies are included in all equations. *** significant at 1%. ** significant at 5%. * significant at 10%.

Table 5: Job Creation and Destruction Regressions (3) [a]

	Without Entry&Exit			With Entry&Exit		
	JDR	JCR	NJCR	JDR	JCR	NJCR
Accommodation and Food Service						
$age_{\leq 5}$	-0.0003	0.0044***	0.0047***	-0.0011***	0.0049***	0.0060***
	(0.0002)	(0.0004)	(0.0004)	(0.0002)	(0.0003)	(0.0003)
$age_{>5,\leq 10}$	0.0003	-0.0001	-0.0005	0.0000	-0.0001	-0.0002
	(0.0002)	(0.0003)	(0.0004)	(0.0002)	(0.0003)	(0.0004)
$size_{\leq 20}$	-0.0341***	-0.1000***	-0.0659**	-0.0333***	-0.1001***	-0.0668**
	(0.0090)	(0.0255)	(0.0306)	(0.0091)	(0.0255)	(0.0307)
$size_{>20,\leq 100}$	-0.0255***	-0.0838***	-0.0583*	-0.0253***	-0.0839***	-0.0586*
	(0.0091)	(0.0258)	(0.0308)	(0.0091)	(0.0258)	(0.0309)
crisis (cr)	-0.0090	0.0030	0.0120	-0.0089	0.0027	0.0116
	(0.0130)	(0.0413)	(0.0477)	(0.0130)	(0.0413)	(0.0477)
$age_{\leq 5}$*cr	0.0003	0.0014**	0.0011	0.0007**	0.0006	-0.0000
	(0.0003)	(0.0006)	(0.0007)	(0.0003)	(0.0006)	(0.0006)
$age_{>5,\leq 10}$*cr	-0.0005	0.0009*	0.0014***	-0.0003	0.0009*	0.0012**
	(0.0004)	(0.0005)	(0.0005)	(0.0004)	(0.0005)	(0.0005)
$size_{\leq 20}$*cr	0.0077	-0.0036	-0.0113	0.0076	-0.0036	-0.0111
	(0.0130)	(0.0414)	(0.0478)	(0.0130)	(0.0414)	(0.0478)
$size_{>20,\leq 100}$*cr	0.0087	-0.0036	-0.0122	0.0085	-0.0034	-0.0119
	(0.0136)	(0.0417)	(0.0482)	(0.0136)	(0.0417)	(0.0482)
R^2 / #obs	0.06/29957	0.14/29957	0.05/29957	0.05/33610	0.14/33610	0.05/33610
Prof., Sci. and Tech. Activities						
$age_{\leq 5}$	-0.0012***	0.0043***	0.0055***	-0.0009	0.0047***	0.0057***
	(0.0003)	(0.0008)	(0.0008)	(0.0006)	(0.0007)	(0.0005)
$age_{>5,\leq 10}$	-0.0003	0.0020***	0.0022***	-0.0000	0.0019***	0.0020***
	(0.0005)	(0.0007)	(0.0008)	(0.0006)	(0.0006)	(0.0008)
$size_{\leq 20}$	-0.0646***	-0.1689***	-0.1043***	-0.0774***	-0.1680***	-0.0906***
	(0.0207)	(0.0372)	(0.0372)	(0.0243)	(0.0366)	(0.0342)
$size_{>20,\leq 100}$	-0.0555***	-0.1477***	-0.0921**	-0.0685***	-0.1465***	-0.0780**
	(0.0208)	(0.0373)	(0.0371)	(0.0243)	(0.0367)	(0.0342)
crisis (cr)	-0.0257	-0.0509*	-0.0252	-0.0389	-0.0519*	-0.0131
	(0.0226)	(0.0262)	(0.0349)	(0.0261)	(0.0265)	(0.0321)
$age^*_{\leq 5}$cr	0.0006**	-0.0013*	-0.0019**	0.0002	-0.0016**	-0.0018***
	(0.0003)	(0.0007)	(0.0008)	(0.0005)	(0.0006)	(0.0005)
$age^*_{>5,\leq 10}$cr	-0.0001	-0.0012*	-0.0012	-0.0004	-0.0012*	-0.0008
	(0.0005)	(0.0006)	(0.0008)	(0.0006)	(0.0006)	(0.0007)
$size^*_{\leq 20}$cr	0.0238	0.0505*	0.0267	0.0368	0.0496*	0.0128
	(0.0227)	(0.0262)	(0.0351)	(0.0259)	(0.0256)	(0.0315)
$size^*_{>20,\leq 100}$cr	0.0211	0.0397	0.0185	0.0349	0.0385	0.0035
	(0.0229)	(0.0262)	(0.0352)	(0.0260)	(0.0256)	(0.0318)
R^2 / #obs	0.06/33715	0.18/33715	0.05/33715	0.06/36579	0.18/36579	0.04/36579

[a]Benchmark groups are firms over 10 years old and with over 100 employees. Clustered robust standard errors are in parentheses. 2-digit industry and time dummies are included in all equations. *** significant at 1%. ** significant at 5%. * significant at 10%.

Table 6: Job Creation and Destruction Regressions (4) [a]

	Without Entry&Exit			With Entry&Exit		
	JDR	JCR	NJCR	JDR	JCR	NJCR
Administrative Activities						
$age_{\leq 5}$	-0.0115**	0.0061	0.0177***	-0.0114**	0.0064	0.0178***
	(0.0050)	(0.0059)	(0.0067)	(0.0047)	(0.0055)	(0.0064)
$age_{>5,\leq 10}$	-0.0098	0.0015	0.0113	-0.0089	0.0016	0.0105
	(0.0064)	(0.0089)	(0.0128)	(0.0062)	(0.0087)	(0.0125)
$size_{\leq 20}$	-0.1520***	-0.3148***	-0.1628***	-0.1529***	-0.3202***	-0.1674***
	(0.0293)	(0.0554)	(0.0316)	(0.0295)	(0.0560)	(0.0319)
$size_{>20,\leq 100}$	-0.1369***	-0.2654***	-0.1286***	-0.1364***	-0.2690***	-0.1327***
	(0.0306)	(0.0577)	(0.0333)	(0.0308)	(0.0582)	(0.0336)
crisis (cr)	-0.0474*	-0.2270***	-0.1796***	-0.0579*	-0.2215***	-0.1636***
	(0.0285)	(0.0522)	(0.0450)	(0.0296)	(0.0504)	(0.0409)
$age_{\leq 5}$*cr	0.0059	-0.0058	-0.0117	0.0055	-0.0052	-0.0108
	(0.0043)	(0.0059)	(0.0074)	(0.0041)	(0.0056)	(0.0070)
$age_{>5,\leq 10}$*cr	0.0051	-0.0058	-0.0109	0.0042	-0.0053	-0.0095
	(0.0055)	(0.0102)	(0.0138)	(0.0054)	(0.0099)	(0.0134)
$size_{\leq 20}$*cr	0.0572**	0.2071***	0.1499***	0.0513*	0.2111***	0.1598***
	(0.0272)	(0.0511)	(0.0400)	(0.0279)	(0.0511)	(0.0404)
$size_{>20,\leq 100}$*cr	0.0574**	0.1727***	0.1153***	0.0504*	0.1757***	0.1253***
	(0.0279)	(0.0526)	(0.0417)	(0.0287)	(0.0526)	(0.0421)
R^2 / #obs	0.10/9432	0.18/9432	0.04/9432	0.10/10321	0.18/10321	0.04/10321

[a]Benchmark groups are firms over 10 years old and with over 100 employees. Clustered robust standard errors are in parentheses. 2-digit industry and time dummies are included in all equations. *** significant at 1%. ** significant at 5%. * significant at 10%.