Determinants of Firm Entry and Exit in Canada and the U.S.

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Abstract

This paper aims to better understand the entry and exit of firms. Empirical studies examining the effects of macroeconomic variables- unemployment rate, real GDP, interest rate, and economic growth rate- on firm dynamics are reviewed. Two countries, Canada and the U.S., and five industries in each country are separately analyzed. The major underlying idea of this paper is that firm dynamics are closely related to labour economics, economic policies and regulations, and various economic shocks. The results indicate that all four macroeconomic variables significantly affect entry and exit. U.S. firms show more sensitivity to the unemployment and economic growth while Canadian firms are more sensitive to real GDP and the interest rate.

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1. Introduction

Firm dynamics play a major role in the economy. An economy is constituted of an innumerable number of firms that supply necessary goods, services, and technologies. Firms affect the quality of human life in various ways. For this reason, firm dynamics have been a subject of study for economists for many years. Rapidly increasing numbers of studies explain heterogeneous behaviours of firms and different approaches in analyzing equilibrium market structure. Firms' entry and exit are determined by many economic factors and industrial rules and regulations. They bring positive impacts to industries in terms of innovation, development, and market stability. Entry brings new technology and more efficiency to the economy which induces incumbents to innovate and further develop, while exit removes old technologies and pushes less productive firms out of the industry. After successful entry, firms go through competition for survival. Baldwin and Gu (2006:21) refer to this as "selection and learning effects." Although many firms enter the market and struggle to survive, only a small fraction of them succeeds.

Aghion et al. (2007), using samples of sixteen countries with developing and emerging economies, prove and state that there are three stylized facts on firm dynamics. First of all, between 20-25% of firms are either created or destroyed each year in most countries and the entry and exit rates in industries are highly correlated. Secondly, more than 80% of firms that enter and exit the industry are small and medium sized firms, and finally, although chances of survival vary depending on market conditions and external economic factors, 10-30% of new firms exit the market within two years of entry.

Both entry and exit rates have been declining in Canada since the 1980s (Cao et al., 2017), and the measures of business dynamics, rate of firm turnover, and entrepreneurship have been declining in the U.S. in the last few decades (Haltiwanger, 2015). In reality, there has been enormous growth in the economy for the last few decades in Canada and the U.S., and this was expected to have positive effects on entry and negative effects on exit. This conflict between the expectations and observations can be explained by the combined effects of economic growth with other economic variables. The overall effect on entry and exit may be different from what the theory predicts. For this reason, study of firm dynamics has been of great interest for economists in various areas.

Firm dynamics are often studied with business cycles. During economic booms more firms are expected to enter and fewer firms are likely to exit and opposite results are expected for economic downturns. Business cycles are influenced by macroeconomic variables such as monetary policy, unemployment, gross domestic product (GDP), the interest rate, and economic growth.

In this paper, using Canadian and U.S. data, the effects of macroeconomic variables including the unemployment rate, real GDP, interest rate, and economic growth rate on firm entry and exit are analyzed. Secondly, effects in five industries, manufacturing, finance, construction, agriculture, and transportation, for both countries are briefly looked at. Simple ordinary least square (OLS) econometric method is used for regressions and for the robust regressions, Newey-West standard error is applied.

Summary statistics show that entry and exit have been steady in Canada and the U.S. throughout the subject years of study and there are correlations with a lag between entry and exit. Entry or exit (dependent variables) in either country does not show particular correlations with macroeconomic variables (independent variables). Real GDP in Canada shows steady rates while real GDP in the U.S. shows significant uptrend, and they indirectly represent the economic growth of each country. Regression analyses show significant causal relationships between entry and exit and macroeconomic variables, and the results are economically and statistically significant. The first major finding of this paper is that entry and exit do not affect each other in both countries, and the second major finding is that U.S. firms are more sensitive to unemployment and growth rate while Canadian firms are more sensitive to real GDP and the interest rate.

Firm dynamics and the economic determinants of each stage of firm's life will be explained in section 2. The product market cycle in relation to firm dynamics will be explained in section 3, the model and the econometric techniques used for regression will be presented in section 4, summary statistics and regression analyses will be explained in sections 5 and 6 respectively, and finally, section 7 will conclude.

2. Literature Review

2.1 Entrepreneurship

In the early 1900s, creating a new firm is first introduced as a form of entrepreneurship by the economist Joseph Alois Schumpeter (Santarelli and Pesciarelli, 1990). He describes an entrepreneur as a creative, energetic, and unique path-taker and entrepreneurship as a process in which new enterprises become active and viable. From another study of Hebert and Link (1989), an entrepreneur is defined as a creative individual who is capable of taking risks into opening new businesses and also able to revive existing ventures.

In their study, Santarelli and Vivarelli (2007) say that entrepreneurship in many sectors is equal to forming a fringe of firms and the likelihood of survival of these firms is particularly low due to the "revolving door" mechanism in which there are continuous entry and exit in the market. This statement represents the idea that new small entrants operate at lower than the minimum efficient scale (MES) level of output and their insufficient profit to cover the sunk cost of entry decreases the probability of survival. Beesley and Hamilton (1984) define this revolving door mechanism as "turbulence," such that new firms create minor impact in the market and eventually disappear without noise. Alternatively, Schumpeter (1942) states that entry of new efficient firms with better technology will force the incumbents out of the market, in which he termed this phenomenon as "creative destruction." Schumpeter also states that depending on the type of industry, the dominance of the two phenomena- turbulence or creative destruction - will vary.

In their study about unemployment and self-employment, Golpe et al. (2012) introduce the "pull" and "push" hypotheses. The pull hypothesis explains that entrepreneurs are more encouraged to start a new firm when demand is high, and consequently unemployment is lower. Alternatively, the push hypothesis explains that, during an economic downturn, unemployment rises and this increases the formation of new firms because higher unemployment reduces potential entrants' opportunity cost of starting new businesses. Interestingly, Santarelli et al. (2009), using firm data for 103 Italian provinces, conclude that the positive relationship between unemployment and net entry is not due to a push effect but to the negative relationship between unemployment and net exit.

Entrepreneurship, in other words firm entry, is beneficial for economic development in terms of job creation and reduction of unemployment. It also works as a main driving factor for technological upgrading in the market and growth in productivity (Santarelli and Vivarelli, 2007).

2.2 Firm dynamics

Most microeconomic theories on entry and exit are usually developed within the field of industrial organization, and since the number of firms and structural changes in the industry are closely related to the employment rate, this topic has also been studied by labour and regional economists (Santarelli and Vivarelli, 2007).

Entry and exit are highly influenced by barriers. Some studies conclude that barriers to entry also work as barriers to exit. More specifically, Shapiro and Khemani (1987), based on the work of Caves and Porter (1977), find a symmetry between entry and exit barriers in small sized firms using Canadian cross-sectional data. Their results indicate that large and more capitalized firms are immune to the displacement effect (i.e. new firm replaces existing firm), thus among these firms they do not find significant symmetrical relationships between entry and exit barriers. They test two sets of equations with a sample of small sized firms: one set with the assumption of existence of displacement effect and another set with the assumption of non-existence of displacement effect. From two sets of study, they find a symmetry in the determinants when they assume the displacement effect does not exist. Also, they state that when there is no displacement effect, deterrence of entry restricts displacement and thus deters exit.

Birth and death constitute industrial firm dynamics (Ilmakunnas and Topi, 1999). Entry helps create and maintain competition between firms and further enhances efficiency through R&D and innovation. Firms that enter usually have newer and better technologies than incumbents. They encourage and stimulate incumbents' development and growth and further affect structural changes in different industries.

Economic growth plays a major role in firm dynamics. During high economic growth, due to higher chances of success from higher profits, new firms easily enter the market regardless of any entry barrier (Segarra and Callejon, 2002), although sometimes it may be the incumbents' strategy to let new firms enter on a small scale, and once they grow into larger scaled firms they can more easily deter further entry threats. In the short run, economic growth

has a positive relationship with entry and a negative relationship with exit since the economy can tolerate more firms without giving them negative profits (Santarelli and Vivarelli, 2007). In the long run, when there are more firms entering the industry, negative income effects from increased competition override positive effects from economic growth, thus exit rate rises. Although rates of entry and exit fluctuate from time to time depending on economic conditions and different strategies used by incumbent firms, the industry eventually converges to and maintains the steady state.

In an open economy, the exchange rate plays an important role in firm dynamics. Based on the Marshall-Lerner condition, when the sum of export and import elasticities exceeds one, depreciation of the home currency will increase exports and create a positive trade surplus. This should bring positive profit to firms, which in turn has significant positive effect on entry and negative effect on exit (Ilmakunnas and Topi, 1999).

Baldwin and Rafiquzzaman (1995) show that as the number of firms increases there is more replacement of older firms by new entrants. The idea further implies that more viable firms in the industry means that the products sold in the industry must be in high demand and the level of technology of incumbents can easily be conquered by entrants only with a slightly more efficient technology of entrants. On the other hand, Audretsch et al. (2000) find that, in a highly competitive industry, it is harder for any new entrant to survive because high initial cost with post-entry zero profit lead them to bankruptcy.

Replacing the old incumbent firm by a new entrant implies that entry and exit are interrelated and/or correlated with a lag; one event enables prediction of occurrence of another event. In industries with a high turnover rate, this positive correlation explains the short life expectancy of firms (Bartelsman et al., 2005). Besides the correlation between entry and exit, there exists a positive correlation of each event with its own history. Johnson and Parker (1994) state that past entry or exit may be positively correlated with current entry or exit, respectively, which they call a multiplier effect. This effect is explained as follows: more entry is a result of new entrants imitating past entry, and more exit of firms signals bad prospects of industry that negatively affect the survival of firms (Johnson and Parker, 1994). A multiplier effect can also be observed as a physical concentration of firms in certain geographic areas that attract consumers and further induce creation of firms during an economic boom.

Johnson and Parker (1994) also state that opposing forces affecting the birth and death of firms are interrelated, which they term a competition effect. If there is a birth then subsequently there is a death, and vice versa. The competition effect is based on the economic theory of competitive markets that, if competition increases, some firms fail and exit and the economy eventually returns to the steady state.

2.3 Life of firms

2.3.1 Entry

Entry means establishing a new operation in an industry. Entry is initially determined by entry barriers. Entry barriers protect incumbents by slowing down entry. Bain (1956) defines two types of entry barriers: structural and strategic. Structural entry barriers are explained by product differentiation and lower cost advantage such as lower MES. On the other hand, strategic entry barriers are explained by incumbents action posed against new entrants such as raising prices and costs above the competitive levels. According to microeconomic theory, entry with lower than MES is not profitable since marginal cost is higher than average cost. On the contrary, if the firms enter above the MES of the industry, post-entry output would be too large and the decreases in price bring insufficient income.

Entry deterrence in oligopoly creates a free-riding problem in the industry (Fershtman and Pakes, 2000). Since there are only few firms in the same industry, one firm's action affects other firms. This implies that if one firm's action deters the entry of new firms other firms benefit from this action without putting any effort.

Creation of a new firm and entering the industry is not as easy as it sounds. First it starts with an entry cost, usually sunk, that is incurred before or as soon as entry occurs, and then the new firms have to overcome harsh market conditions including market regulations and competition. It is believed that entry is higher during expansions and lower during downturns. In support of this idea, business cycle models predict patterns of entry. Regarding the effect of business cycle on firms' decision of entry and exit, an empirical study is done by Perotin (2006). He uses data on firms in France and finds that the business cycle does not have any impact on

exit decisions of firms but alternatively different firms show significantly different processes of firm creation with an impact of the business cycle on entry.

Many previous studies using business cycle models keep the number of firms constant, assume the same level of investments for all firms, and most focus on the number of hired labour (Lewis, 2009). Lewis argues that labour is an important factor of the business cycle. As one of the positive impacts of hiring more labour, increasing labour productivity leads to increase in future expected profits by reducing production costs, and this encourages entry.

New firms can be established as long as their expected profit exceeds the entry cost. Expected profit can be determined by future expected demand conditions; if the expected future demand is high, entering firms expect to incur net positive profits, thus entry is encouraged, and vice versa. On the other hand, firm establishment is also largely affected by monetary policy. Monetary expansion means there is more money circulating in the economy, thus the interest rate decreases and encourages borrowing. According to the economic theory of sticky prices, the decreasing interest rate increases the real dollar value, increases production costs and finally increases the entry cost (Lewis, 2009). Overall, the total cost of entry will be higher than the expected profit, thus the fall in interest rate will deter entry.

Some economic factors that either directly or indirectly affect entry are explained below. Examples of microeconomic factors are productivity and entry costs and examples of macroeconomic factors are aggregate spending and monetary policy.

1. *Productivity*

   With a fixed amount of inputs, increasing productivity lowers production costs and total costs (Lewis, 2009). A decrease in total cost implies a decrease in marginal cost and this further implies a decrease in price. According to competitive market theory, price must equal marginal cost to achieve zero deadweight loss for market efficiency, and a further decrease in price causes lower profit. While a decrease in expected profit has a negative effect, a decrease in total entry cost has a positive effect on entry. An overall effect of productivity on entry depends on the dominance between these two effects.

2. *Entry cost*

   An increase in entry cost has a negative effect on entry since it requires higher initial capital. On the other hand, a decrease in entry cost is believed to have a positive effect on entry by making investment more valuable and attractive. As more potential entrants are attracted to make investments as an entry, consumption falls (Lewis, 2009), then consequently aggregate consumption falls. This implies that short-term demand falls and expected future profit will be low. At the same time, negative entry cost shock may lead to an increase in aggregate output due to the expansion of the market with more new firms. An overall effect of entry cost on entry depends on the dominance of either fall in profit or increase in output.

3. *Aggregate spending*

   Exogenous spending, which is an arbitrary external condition, reduces private consumption and due to negative wealth effect, hours worked increase (Lewis, 2009). Higher labour supply causes an expansion of aggregate demand and a rise in output. An increase in aggregate demand and output causes inflation and induces the central bank to raise the interest rate. This makes future assets more valuable than today's, thus has a positive impact on entry.

4. *Monetary policy*

   Monetary expansion is designed to encourage people to borrow at a lower interest rate and also protect banks from losing from paying high interest rates on clients' savings in bank accounts. An increase in borrowing increases consumption and aggregate demand. This leads to an increase in output, allowing firms to take advantage of selling products and services at a marked-up price. An increase in price leads to inflation and this in turn causes a reverse of the marked-up price (Lewis, 2009). Lower price gives lower profits, sticky price causes increase in real wage, and lower interest rate decreases the future value of assets. While the increase in output has a positive effect on entry, lower interest rate has a negative effect on entry. The overall effect of monetary expansion on entry depends on the dominance between these two effects.

Lewis (2009) tests how firm entry is affected by economic shocks, using vector autoregression (VAR) method. He uses a dynamic stochastic general equilibrium (DSGE) model as a benchmark and he studies what effects the economic shocks, such as productivity, spending, monetary, and entry cost shocks have on firm entry and economic variables such as output, inflation, interest rate, and firm profits. He concludes that most of his empirical results agree with the benchmark model, and specifically finds that productivity, spending, and entry cost shocks enhance entry.

Besides the economic shocks introduced above, there exist policies and regulations in the market that affect entry. The role of stabilization policy is studied by Bergin and Corsetti (2005) and, more specifically, research on pollution regulation as a barrier to entry is done by Dean and Brown (1995).

The market economy is full of uncertainties and fluctuations in response to shocks. Bergin and Corsetti (2005) mention that the main policy for stabilizing the economy is monetary policy where it regulates the number of firms in the market, especially the number of entrants, and also maintains the socially optimal level of production and output of firms. In a distorted economy that lacks stabilization policy, firms will sell products at a higher price, some as high as monopoly price, to make higher profit. If firms sell at a price higher than marginal cost, they will sell less output and further produce less, which will reduce short-run profits. But Bergin and Corsetti (2005) state that there is a chance that firms will rather make higher profits due to uncertainty. If this is true, this uncertainty will encourage entry. In the long run, entry of new firms will decrease market concentration and increase competition. Bergin and Corsetti (2005) also present an alternative view of uncertainty in the market: the uncertain expected profits will deter entry.

Two opposite views of effects of environmental regulation on entry are studied by Dean and Brown (1995). Environmental regulation, such as pollution regulation, is very specific to firms in manufacturing due to their production with factories. Regulation of pollution is of great interest all around the world as there has been increasing degradation of the environment due to the increased demand of manufactured goods. Many firms may think regulation is too costly compared to the small benefits they may get. Environmental regulation is necessary and must be enacted to provide social and economic benefits including improvement of population health and a more resilient environment.

The argument that environmental regulation may deter entry is straightforward: increase in entry cost, in which the total burden of cost is borne by entrants, may scare potential entrants. Regulation means stricter standards in which it requires new firms, usually entering with new facilities, to have higher level of initial capital and numerous permits for business operations (Dean and Brown, 1995). Also, regulation pushes for efficient production of new entrants which can be achieved by increasing the size of operations. This increases the MES which pushes the entry cost upward, and consequently deters entry.

One positive impact of environmental regulation on entry is a size "tiering" system (Dean and Brown, 1995). This system benefits new firms through imposing different regulations based on the scale of firms; less strict regulation is imposed on small new entrants. Because of the incumbent's older technology, regulators believe that they cause more harm to the environment than new firms. Due to this reason, regulators aim to maximize their returns on enforcement activity focusing on large incumbent firms that can also have significant effect on reducing pollution. New firms' accessibility to newer and better technology not only gives them benefits of less strict regulation but also enables them to choose their level of production without competition from incumbents. Although incumbents can always upgrade their technology, the cost burden will be too heavy compared to the incremental benefit they will get.

It is unclear whether environmental regulation has positive or negative impact on firm entry because it may differ depending on the market conditions and characteristics. After analyzing the effects of environmental regulation on entry using U.S. manufacturing industries data, Dean and Brown (1995) conclude that the entry deterring mechanism overpowers the entry enhancing mechanism and that essential entry-inducing mechanisms exist only in few industries.

Policies and regulations in the industry exist to induce entry and to set up entry barriers to maintain market equilibrium. Out of many policies that can be implemented for market regulations regarding firms' entry, monetary policy is one of the most effective policies applied to all firms regardless of their type and size. Potential entry may be induced or deterred by interest rate changes caused by monetary policy. Every economic policy has its own roles and routes for how it affects entry, yet all policies and regulations are interrelated to each other. Absence of policy in the market will bring corruption in the short run due to unregulated price and inflation. A healthy market should always be regulated to maintain market equilibrium and stability.

2.3.2 Survival

Survival of firms is affected by factors such as time of entry, size of firms, type of industry, and the ability of entrepreneurs (Santarelli and Vivarelli, 2007). It is a stylized fact that new firms enter on a small scale with small capital and capacity but with newer technology which inhances productivity. Survival of firms in competitive markets is most interestingly studied with industry that involves technology due to R&D (Santarelli and Vivarelli, 2007; Cefis and Masili, 2005). Industries that do not require use of technology simply compete in price while sharing consumers. Firms with fewer consumers will suffer from lower sales, resulting in failure of some firms with insufficient capital and less patience. On the other hand, in industries that require use of technology, new firms enter the market with upgraded technology which acts as a big threat to incumbents.

Many previous studies mention that the survival probability of firms is positively correlated to firm's size and age (Mata et al., 1995; Audretsch, 1995; Bartelsman et al., 2005). The larger the new firm, the more likely it will survive. Stinchcombe (1965) describes it as a "liability of newness" in which young organizations have a higher risk in surviving than older organizations, and Baum and Korn (1996) describe it as a "liability of smallness" in which large firms display higher probability of survival. New firms lack sufficient resources and have very weak relationships with both inside and outside stakeholders, thus as the firms age, the probability of survival increases. In fast growing industries, entry increases regardless of entry barriers without causing much harm to competitors but the uncertainty in survivorship still remains. There are some other studies showing the relationship between survival and the current size of firms. Using U.S. manufacturing data, Hall (1987) finds a negative relationship and Doms et al. (1995) find no significant relationship between firm size and survival.

The likelihood of survival and post entry growth varies among industries. Survival and growth are closely linked to firm's underlying technology and ability (more specifically entrepreneural ability). Jovanovic (1982) says firms often imprecisely estimate their ability level and once the firms experience the market and observe the unexpected bad outcomes, they decide to exit the market. Therefore, firms must learn and absorb new information at a faster pace than competing firms to survive and grow (Audretsch, 1995).

There are two major factors that affect firms' survival: innovation and ability to learn. Schumpeter (1942) argues that innovation plays a key role for the survival of firms. In industries where innovation activity of small entering firms plays a major role, the likelihood of new firm's survival is less than in industries where innovation activity does not play a major role. Entrants with high innovation ability offer differentiated products and display high survival rates and growth rates. In terms of ability to learn, Jovanovic (1982) argues that new firms acquire knowledge and experience by carrying out production and learning the specifics. New entrants bear much more disadvantage of asymmetry of information from less experience in the market compared to incumbents (Jovanovic, 1982) and also entrants' chances of survival decrease with a highly turbulent market environment (Audretsch, 1995). Entrants must absorb all the necessary information quickly, including the level of turbulence in the market, to survive.

Not all start-up firms experience growth. New firms are exposed to high risk of failure as soon as they enter the market, and only some of them survive the critical start-up period. This does not mean all firms who survive the start-up period will survive for long either. Wagner (1994) argues that the firm's growth rate determines the rate of survival. On the contrary, Evans (1987) argues that the size of the firms is a major determinant of the rate of survival. Small entrants that operate below the MES are more exposed to risk of failure and their critical source of survival is the amount of assets and capital owned by the firms. Starting a firm with a fairly large scale of production increases the probability of surviving.

Audretsch (1995) studies the relationship between the likelihood of survival and the growth rate using data from the *U.S. Small Business Database*. His major finding is that the variance in survival rates across industries is greater than the variance in entry rates. The tendency for new firms to enter is relatively constant while the likelihood of those firms' surviving the start-up period varies. This indicates that barriers of survival are stricter than barriers to entry (Audretsch, 1995). Similar results are also found in studies done by Baldwin and Rafiquzzaman (1995) with Canadian data and Wagner (1994) with German data.

Technology innovation is positively related to survival (Hall, 1987). R&D activities by the firm allow its market value to increase and consequently increase the survival rate. According to Hall (1987), the effect is more evident for firms that do not have patents. Innovation also allows firms to introduce new products and operate under a more efficient environment. While innovation is important for survival of new firms, it is also important for

incumbents for protection against the threat of entrants. Other than product innovation, process innovation, in which firms improve their efficiency, is also important. Cefis and Marsili (2005) mention that firms that implement process innovation are given higher benefits of survival, such as increases in life expectancy, than from product innovation. This benefit of innovation offsets the liability of newness and liability of smallness.

Another approach to study firm survival is used by Renski (2008). The study is to see the differences of new firm entry, survival, and growth between urban and rural areas in the U.S. Renski (2008) adopts the urban incubator hypothesis from Hoover and Vernon (1959) to study intra-regional dynamics of entrepreneurship. This hypothesis states that high-density central cities are most advantageous for establishing new firms due to countless opportunities and resources. The primary force that drives new business for entrepreneurs is a convenient location. Even though the cost of being in a central area is high, the benefit that comes from convenience may offset the cost disadvantage. Entry into a new market, for example, a new city in a rural area, is inherently more risky than entry into an already established market (Renski, 2008). Businesses must continually experiment and innovate for product differentiation and business structure improvement to gain higher competitiveness, and urban areas offer the most suitable environment for development. New firms enter in small size in urban areas, struggle to survive and grow, and when the firm grows successfully, it may move to a rural area to take advantage of cost differentials and further expand in scale. The rate of new firm creation is expected to be higher in urban areas than in rural areas. Although the survival rate in urban areas is lower than in rural areas, once firms survive, the growth rate is much faster in the urban core.

Studies discussed so far explain how entry of new firms threaten incumbents by increasing competition in the market, but work by Baumol et al. (1982) develop an interesting theory that new small firms will only compete with other new small firms in the market and few entrants exit even before they become a threat to incumbents. Although small entrants produce well below more efficient incumbent firms' MES, some of them will still survive if they produce above small firms' MES.

Birth and survival are critical processes and the most painful periods of the firms' life. Many new firms struggle and try their best in surviving but only few of them survive the critical start-up phase and experience further growth. New firms compete with either incumbent firms or other new firms in the market. The entrants strive to survive through cost reduction, increased

productivity, innovation, differentiation, and learning. If they fail to survive, firms exit the market.

2.3.3 Exit

Exit is as important as entry for market dynamics. Highly productive firms survive, and the rate of survival also depends on the starting size and age of firms, thus younger and smaller firms have lower chances of survival.

New firms have higher chances of exiting than incumbents. First of all, new firms become productive and recover the sunk cost of entry only after they survive the start-up period. For this reason, only few entrants, those who start with high initial capital and high productivity level, continue operations and the others exit. Secondly, new firms face high asymmetry of information, which constitutes a disadvantage in terms of efficiency and financing, thus many new firms exit. Lastly, learning from experience decreases the rate of exit, thus older firms have higher chances of staying in the market.

Mature firms exit through various routes. Fortune and Mitchell (2012) divide the routes of firms' exit into two: dissolution and acquisition. Dissolution is chosen when firms lack functional abilities and acquisition is chosen when firms lack entrepreneurial abilities. Balcaen et al. (2012) argue that firms exit after distress, categorizing the routes into three: bankruptcy, voluntary liquidation, and merger and acquisition (M&A). Balcaen et al. (2012) argue that distressed firms' exit follows two stages. In the first stage, firms decide to exit voluntarily or they are forced into bankruptcy due to inferior performance. Voluntary exit is a more efficient strategy since it predicts that firms own enough cash and assets to cover the leftover debt. In the second stage, if firms decide to exit voluntarily, they must decide whether to exit through voluntary liquidation or through M&A. Liquidation means selling all assets in return for cash and all the creditors and shareholders are paid whereas M&A keeps a big portion of the firms' original capacity and assets. M&A is associated with high performance firms. The Coase theorem (Coase, 1960) states that, in a perfect world, economically distressed firms should efficiently exit through voluntary liquidation. In support of the Coase theorem, Balcaen et al. (2012) find that, statistically, the likelihood of voluntary liquidation is higher than M&A due to the existence of many different levels of firms' performance.

In the real economy, most distressed firms are forced to exit through bankruptcy (Balcaen et al., 2012). Declaring bankruptcy induces direct and indirect costs and none of the creditors gets paid in full nor does any shareholder get the full value of equities back. Due to these reasons, bankruptcy is considered as the most inefficient and unfavourable type of exit.

Some economic factors that affect firms' exit are listed below.

1. *Economies of scale*

In a competitive market, firms produce at the MES level of output based on a zero profit condition and maximum level of social welfare. If firms operate at a level of output below the MES, firms face size and cost disadvantage compared to incumbents and larger firms. Audretsch et al. (2000) find that there are some industries in which scale economies are more important. For example, in high-technology industries, the price level of products or services is much higher than the cost of provision thus scale economies become less important in exit determination. According to Audretsch et al., the importance of scale economies is negatively related to firm exit.

2. *Industry growth*

Compared to a rapidly growing industry, a slowly growing or declining industry faces a higher exit rate. Segarra and Callejon (2002), using Spanish manufacturing data, find a negative relationship between industry growth and exit rates. On the contrary, Audretsch et al. (2000) find a positive relationship and explain this odd result as a presence of high uncertainty in high growth industries.

3. *Profitability*

High profit increases firms' chances of survival and thus has a negative impact on exit. Audretsch et al. (2000), using Dutch manufacturing data, find that a higher price-cost margin is negatively related to exit in the short run but less so in the long run.

4. Market concentration

In a perfectly competitive market, since there are many small firms, market concentration is very low. Each firm will have a small share of total industry profit and some firms will experience difficulty in survival. If firms are collusive, higher concentration will have a positive impact on firms' viability and a negative impact on exit. Doi (1999), using Japanese manufacturing industry data, finds a negative relationship between market concentration and exit. In another study by Cetorelli and Strahan (2006), using U.S. banking data, they find that higher concentration in the banking industry discourages entry, induces the growth of young firms, and delays exit of older firms.

5. Capital requirements

In industries that require high capital for operation, firms are more committed to their resources and entrepreneurs put more effort to remain in the industry. Audretsch et al. (2000), using Dutch manufacturing data, find a negative relationship between capital intensity and exit.

6. Sunk costs

Firms that incur higher sunk costs will put more effort to recover the costs, thus will have lower chances of exiting. The study by Fotopoulos and Louri (2000), using Greek manufacturing data, show a negative relationship between sunk costs and exit.

7. R&D

R&D is one of the firms' investment options and it involves a significant portion of sunk cost. Higher investment makes firms more efficient and provides better products, thus lowers the exit rate. In contrast to this theory, Audretsch et al. (2001) argue that R&D intensive industries are associated with large uncertainties therefore R&D can be positively related to the exit rate.

8. Firm size

Small new firms face higher chances of failure and exit. Larger firms own more physical equipments, capital, financial instruments, and labour. It is easier for larger firms to

operate at the MES and get a cost advantage. Audretsch et al. (2000) and Segarra and Callejon (2002) conclude that firm size is negatively related to exit.

9. Firm age

The longer the firms serve in the market and gain experience and knowledge, the less asymmetry of information they experience and the more capital they build. Older firms can better cope with external shocks and stresses, thus have lower chances of exiting. Agarwal and Gort (1996), using American manufactured products data, and Mata and Portugal (1994), using Portuguese manufacturing data, find a negative relationship between firm age and exit.

10. Leverage

If firms borrow by issuing bonds or equities, they must pay back interests and principals for bondholders and declare dividends for shareholders, thus if firms' spending is higher the chances of survival will be lower. On the other hand, high leverage means that firms have more cash and assets that are used for growth and development, thus the probability of success is higher. Overall, the effect of leverage on exit is ambiguous. Fotopoulos and Louri (2000) use the ratio of debt to total assets as the leverage variable in their study and find a positive relationship with exit.

11. Interest rate

If firms face a high interest payment, and if the cost of borrowing exceeds profit, then the risk of exit will be higher. Box (2008), using data from Sweden, finds that the interest rate is not correlated with termination of firms. He concludes that this result could be due to independence of firms from external capital.

12. Unemployment rate

The unemployment rate is believed to be a procyclical variable for exit. Exit increases unemployment, and consequently reduces consumption and aggregate GDP. In contrast to this idea, Blanchflower (2000), using OECD countries data, finds no significant relationship between unemployment and GDP growth. Reduced consumer consumption

will negatively affect firms' profit and this will cause firms to exit. Carree et al. (2008) find a negative effect of unemployment on firm exit using Italian provinces data.

Schroder and Sorensen (2012) study a channel of firm exit using international trade. Many countries are open economies in which firms import and export freely, under strictly controlled rules and regulations. Opening to trade allows the world economy to flow more smoothly and helps develop the countries, but on the other hand, it may have some positive impact on domestic firms' exit by increasing the number of competitors. Trade is an efficient redistribution of goods, and the gains and losses from trade highly depend on each country's pricing strategy, productivity, and exchange rate (Schroder and Sorenson, 2012). In periods of economic contraction, less productive traders are forced to leave.

While many previous studies concluded that firms that exit are mostly young and small, Wagner (1999) and Schroder and Sorensen (2012) propose opposite results. Wagner (1999) shows that the share of young firms that exit is indeed small and the majority of exiting firms are older and larger. He writes that higher age and larger size do not protect firms from death. Schroder and Sorensen (2012) find that exogenous technological processes may affect endogenous exit decisions of firms. When new firms adopt technological progress they take over market share from existing firms such that many incumbent firms will be forced out of the market. If technological progress slows down or dampens, new firms will exhibit lower productivity which will decrease the probability of their survival and the remaining older firms in the industry will keep exhibiting older technologies until the next technology shock.

3. Entry and Exit with Product Market Cycle

The life of a firm, from entry to exit, can be studied with a framework of stage of development in an evolving market (Agarwal and Gort, 1996). As a market evolves from young to mature, the rate of growth of demand and its efficiency in production will change. Also, as a market evolves, the importance of learning by doing or learning from experience may decline due to acquisition of other sources of information (Agarwal and Gort, 1996). If this is true, contrary to the finding of Wagner (1999) and Schroder and Sorenson (2012), the age of the firm will not have any impact on firm's survival and exit rate.

The analysis of stage of development of a product market was first introduced by Gort and Klepper (1982). According to this model, the product cycle is divided into five stages based on the rate of net entry of firms: changes in the number of firms in the market relative to the previous period. Stage 1 is the initial period with only few sellers in the market. Stage 2 is immediately followed by stage 1 and is characterized with high positive net entry. Stage 2 can be sub-divided into two phases; an initial acceleration phase followed by a deceleration phase. Stage 3 may contain the maximum number of firms that a market can accommodate and almost no change in net entry of firms; the market is stabilized. Stage 4 shows negative net entry (i.e. exit) after a market experiences an overwhelming number of entrants. Similar to stage 2, stage 4 can be sub-divided into two phases; initial acceleration in negative net entry followed by a deceleration phase. Stage 5 corresponds to maturity of the market with no significant change in net entry.

As the result of Gort and Klepper (1982)'s study, the peak of gross entry coincides with the peak of gross exit which implies that entry is positively related to exit. They argue that increases in both entry and exit imply market expansion.

According to Gort and Klepper (1982), the two peaks of gross entry and gross exit are related to the rate of technical change. In early stage of market evolution (i.e. stage 2), most innovations are done by new entrants with the help of external investors for development, and in later stage (i.e. stage 4), most innovations are done by incumbents for product refinements. They observe a sharp rise in gross exit during stage 4 and explain that this is due to the level of innovation that is harder for firms to imitate compared to the level of innovation in stage 2. Based on the faster technological advancement and less competition in stage 2 compared to stage 4, there is higher profit and more potential for firms to survive in stage 2, which encourages entry.

4. Model and Data

4.1 The Model

This study seeks empirical evidence of effects of some economic factors on entry and exit. Unemployment rate, aggregate real GDP, overnight bank rate, and economic growth rate are

selected as independent variables based on previous research. Entry and exit are hypothesized to be affected by the above economic factors but due to the possibility of reverse causality, which causes serious endogeneity problems and biased results, independent variables in the model are lagged by one period.

The econometric models to be estimated in this paper are as follows.

$$Entry_t = \beta_0 + \beta_1 Unemp_{t-1} + \beta_2 GDP_{t-1} + \beta_3 Interest_{t-1} + \beta_4 Growth_{t-1} + \varepsilon \quad (1)$$

$$Entry_t = \beta_0 + \beta_1 Unemp_{t-1} + \beta_2 GDP_{t-1} + \beta_3 Interest_{t-1} + \beta_4 Growth_{t-1} + \beta_5 Exit_{t-1} + \varepsilon \quad (2)$$

$$Exit_t = \beta_0 + \beta_1 Unemp_{t-1} + \beta_2 GDP_{t-1} + \beta_3 Interest_{t-1} + \beta_4 Growth_{t-1} + \varepsilon \quad (3)$$

$$Exit_t = \beta_0 + \beta 1 Unemp_{t-1} + \beta_2 GDP_{t-1} + \beta_3 Interest_{t-1} + \beta_4 Growth_{t-1} + \beta_5 Entry_{t-1} + \varepsilon \quad (4)$$

where $Entry_t$ is the number of new firms in year t, $Exit_t$ is the number of firms that died in year t, $Unemp_{t-1}$ is the average annual unemployment rate in year t-1, $Interest_{t-1}$ is the average annual bank rate in year t-1, $Growth_{t-1}$ is the annual economic growth rate of a country in year t-1, $Entry_{t-1}$ is the number of new firms in year t-1, and $Exit_{t-1}$ is the number of firms that died in year t-1. Two countries, Canada and the U.S., and five industries in these two countries, Agriculture, Construction, Finance, Manufacturing, and Transportation, are all separately analyzed.

4.2 The Data

The econometric model used is a time-series model and according to data availability, the years 2001-2015 for Canada and 1977-2014 for the U.S. are analyzed. Data for entry and exit, unemployment rate, and GDP for Canada are extracted from *Statistics Canada* (CANSIM 527-0001, 282-0087, and 379-0031, respectively), and data for the bank rate for Canada is provided by the *Bank of Canada*. Data for entry and exit of firms in the U.S. is provided by the *United States Census Bureau* (Firm Characteristics Data Tables), the unemployment rate is provided by the *Bureau of Labor Statistics, United States Department of Labor*, real GDP is provided by the *Bureau of Economic Analysis, United States Department of Commerce*, and finally the U.S. bank rate is provided by the *Federal Reserve Economic Data*. Economic growth rate data for Canada

is directly given by the *Organization for Economic Co-operation and Development* (OECD) and the growth rate for the U.S. is calculated by taking percentage difference in real GDP.

4.2.1 Entry and Exit

Entry and exit in Canada are summarized in table CANSIM 527-0001. The information provided by *Statistics Canada* is primarily collected through the Longitudinal Employment Analysis Program (LEAP) which is not accessible by the public due to protection of firms' private information. The file is constructed based on payroll information and the business number of each employer (i.e. excludes self-employed) in Canada that is officially registered in the taxation system. The payroll information is converted to employment in a unit called average labour unit and this identifies the years of firms' entry and exit. Firm entry is recognized with first payroll information of a firm and exit is recognized with last payroll information of a firm which will not exist in the following period.

The U.S. firm data is provided through the *Business Dynamics Statistics* (BCS) which is initially collected by the Longitudinal Business Database (LBD). The data provide measures of establishments and closures of over six million firms and jobs in the U.S. The data is available from 1976 to the most recent year.

4.2.2 Unemployment Rate

Data for the unemployment rate for Canada is from table CANSIM 282-0087. The information of employment and unemployment of Canada is originally collected by the Labour Force Survey **(**LFS). LFS provides a nationwide panel data and the target population for LFS is individuals 15 years old or older who are not institutionalized, except aboriginals and Canadian Armed Forces members.

The U.S. unemployment rate is provided by the Current Population Survey (CPS). The data is collected by the *U.S. Bureau of Labor Statistics*. The target population is individuals over 16 years old, all across the country, who are not institutionalized. Members of the U.S. Armed Forces are excluded.

4.2.3 Real Gross Domestic Product (Real GDP)

Canadian real GDP data is provided by *Statistics Canada*. GDP is calculated based on output production and 2007 dollars. For this paper, average of twelve months' seasonally adjusted real GDP in each year is used as annual GDP.

The U.S. real GDP data is provided by the *U.S. Department of Commerce.* GDP is calculated based on output production and 2009 dollars. For this paper, values for annual GDP are used.

4.2.4 Interest Rate

The overnight bank rate is chosen as the interest rate variable for this study. The monthly Canadian bank rate is published by the *Bank of Canada* and monthly U.S. bank rate data are obtained from the *Federal Reserve Economic Data (FRED, Federal Reserve Bank of St. Louis).* For this study, the average of twelve months' bank rate is used for the annual interest rate.

4.2.5 Economic Growth Rate

Data for economic growth rate for Canada is provided by the OECD. OECD provides yearly growth rates from 1990 to 2015. Since this paper aims to study from 1976 for the U.S., the U.S. economic growth rates are separately calculated as a percentage difference in real GDP.

4.3 Econometric Techniques and Methodology

The econometric model for this study is a level-level regression model. Ordinary Least Squares (OLS) method is used. For OLS regression to be efficient and unbiased, non-heteroskedasticity must be satisfied, in which the variance of the error term in the regression equation is σ^2. Each regression is tested for heteroskedasticity using White's test and Breusch-Pagan test and some regressions showed heteroskedasticity.

Using lagged variables often causes an autocorrelation problem. The data in this study had autocorrelation for Canada up to the ninth lag and for the U.S. up to the twenty fifth lag. For robustness of regressions, the Newey-West method of standard error estimation is used.

4.3.1 White's Test

White's test is designed to test heteroskedasticity for any form of regression model. This test is performed to see whether the variance of regression's error is dependent on the model's independent variables. The test is based on the null hypothesis that the error terms are normally distributed with variance σ^2, and conversely the alternative hypothesis is that the error terms are not normally distributed (i.e. H_0 : var(ε) = σ^2 and H_1 : var(ε) $\neq$ σ^2). The decision whether the linear regression is heteroskedastic or not is made based on chi-squared statistics value.

4.3.2 The Breusch-Pagan Test (The BP Test)

The Breusch-Pagan test is an alternative to White's test but it can only be used for linear regression. The underlying hypotheses and the test statistics are the same as White's test. Due to the small sample size of the data used for this study, BP test is used after White's test to confirm the existence of heteroskedasticity. Summary of test statistics from White's test and BP test is shown in Table 3 to 6.

4.3.3 The Breusch-Godfrey Test (The BG Test)

The Breusch-Godfrey test is used to detect the presence of autocorrelation in the model. Many econometric tests require normality of errors but this test is valid even if the errors are not normally distributed. Autocorrelation exists in the time series or panel data when the covariance between errors for different regressions or observations is nonzero (i.e. cov(ε_i,ε_j) $\neq$ 0). The BG test can detect any order of autocorrelation. The underlying null hypothesis is that there is no autocorrelation and the alternative hypothesis is that there is autocorrelation. In the model used for this study, Canadian data show autocorrelation up to the ninth lag and the U.S. data show autocorrelation up to the twenty fifth lag.

4.3.4 The Newey-West Estimator

The Newey-West estimator is used to correct autocorrelation and heteroskedasticity. The estimator is developed based on White's test. It estimates the covariance matrix of variables of interest and adjusts these variances to show consistent and unbiased results. Since autocorrelation is detected in the model for this study, the Newey-West estimator is applied to all regressions.

5. Summary Statistics

For Canada and the U.S., the effects of the unemployment rate, real GDP, interest rate, and economic growth rate, on aggregate entry and exit are analyzed. First of all, entry and exit in Canada and the U.S. are separately graphed in Figures 1 and 2, respectively. Entry and exit trends in each country move in the same direction. For Canada, there is exit after entry (i.e. lagged exit) and for the U.S., there is entry after exit. Trends in entry and exit in both countries imply that entry is correlated with exit. This supports Johnson and Parker (1994)'s idea of the interrelationship between entry and exit. It is also partially verified by the correlation coefficient between variables. According to the correlation table for Canada (see Table 1), the correlation coefficient of lagged entry and current exit is 0.7199 which is considered a strong correlation. The correlation coefficient between lagged exit and current entry is only 0.1229, which is very weak but the value may be biased due to the small sample size. On the other hand, the correlation between lagged entry and current exit for the U.S. is 0.5485 and the correlation between lagged exit and current entry is 0.3987 (see Table 2). These correlations are not as strong as the case of Canada, but again, the results may be biased due to the small sample size.

Figure 1. Entry and exit, Canada.

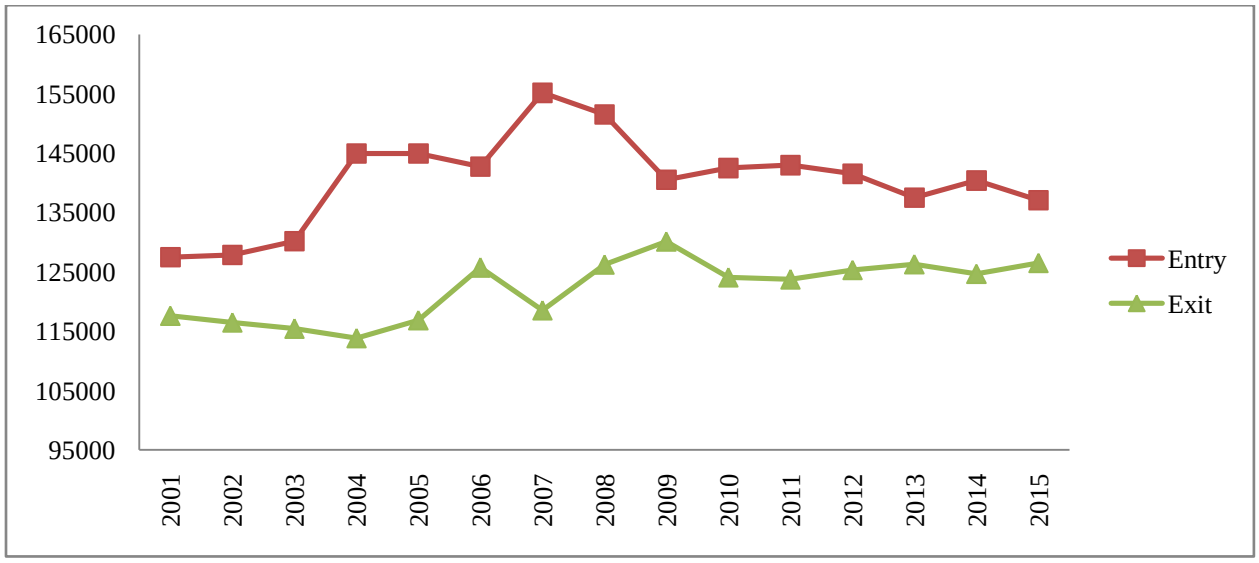
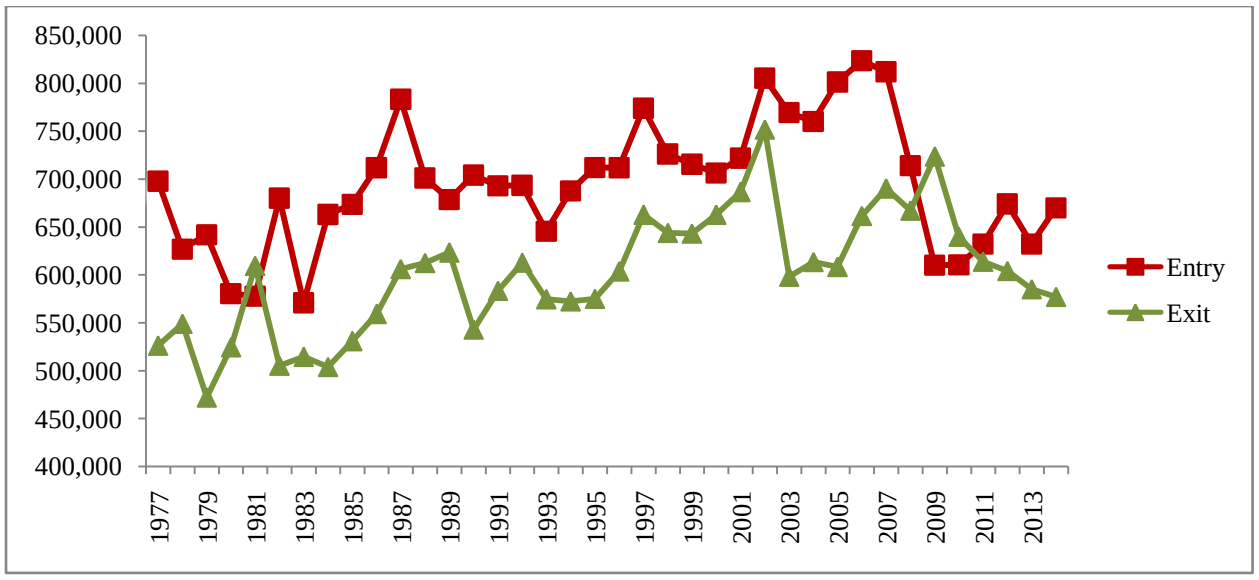


Figure 2. Entry and exit, U.S.



Figures 3 and 4 show trends in unemployment rate, interest rate, and economic growth rate of Canada and the U.S., respectively. All variables show generally stable trends over the years except for when there was a recession in the U.S. from 1981 to 1982 and a global financial crisis in 2008. Economic growth rate of Canada significantly dropped during the global financial crisis and the growth rate of the U.S. were significantly negatively affected during both events.

Significant increase in the interest rate in the U.S. after a recession is followed by a drop in the growth rate and both variables fully recovered to stable rates in 1984.

Figure 3. Unemployment rate, bank rate, and economic growth rate, Canada.

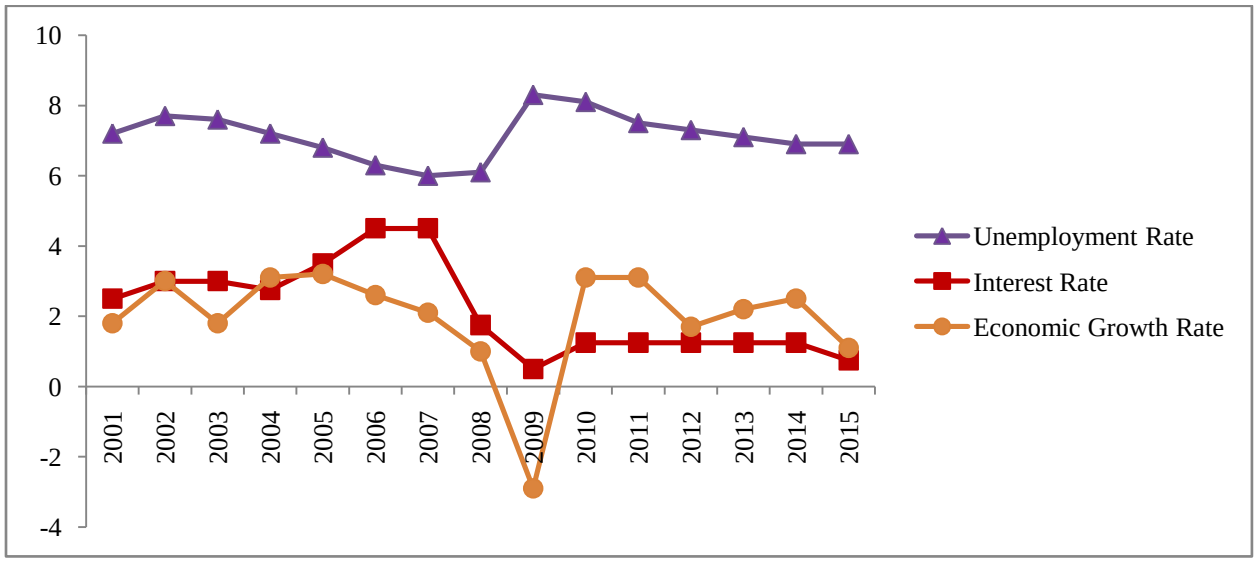


Figure 4. Unemployment rate, bank rate, and economic growth rate, U.S.

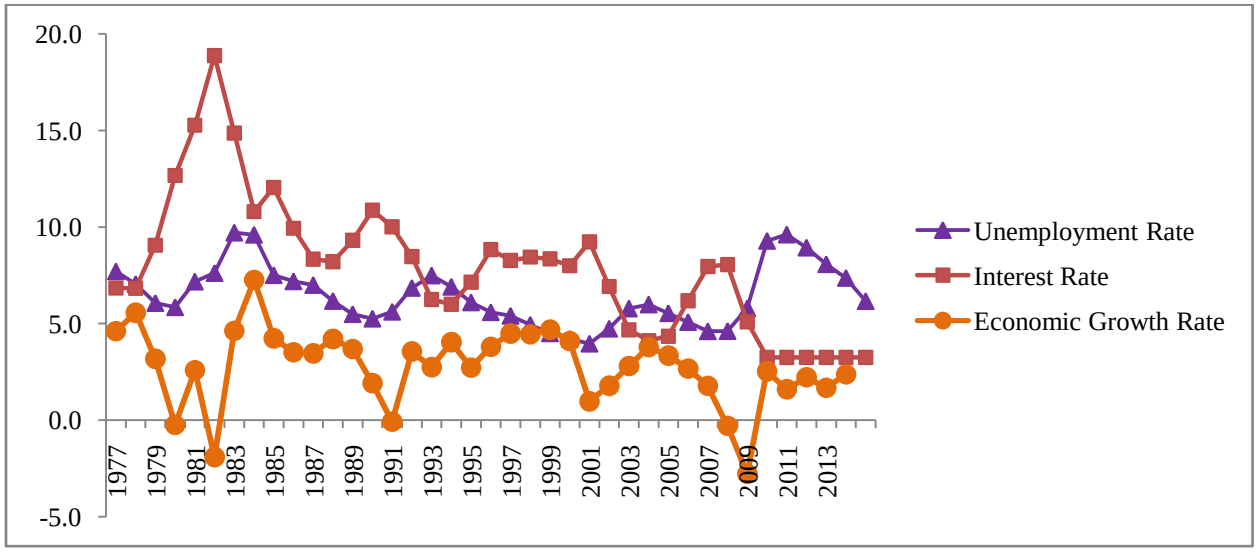
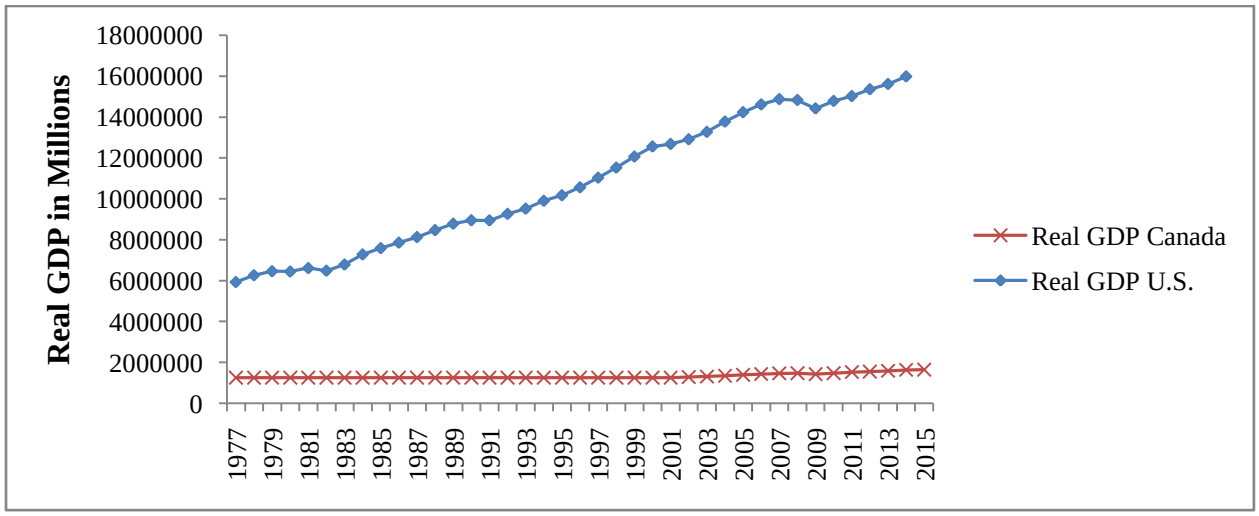


Figure 5 shows real GDP of Canada and the U.S. Real GDP of the U.S. has constantly increased and real GDP of Canada has been steady over the years of study. This is an indirect indication of economic growth in each country. A steady level of firm dynamics and real GDP in Canada explain a stable economy. On the other hand, despite the stable levels of entry and exit,

there is a drastic increase in real GDP in the U.S. since 1977. This explains that the few largest firms that contribute to the majority of the shares in the U.S. market are constantly growing and there are constant entry and exit of smaller firms.

Figure 5. Real GDP, Canada and the U.S.



Cao et al. (2017) conclude that entry and exit rates for Canada and the U.S. declined since the 1980s and steady entry and exit rates found in this study for both countries contradict Cao et al.'s conclusion derived from observation for several decades, and this is most probably due to the short-term data used in this study.

6. Regression Analysis

Using OLS regression with an option of the Newey-West standard errors, the causal relationships based on the econometric models for Canada and the U.S., and the five industries in each country, are analyzed. First, entry (exit) was regressed on lagged value of exit (entry). From many previous studies and also according to this study's summary statistics (refer to Figures 1 and 2), the effect of lagged entry (exit) on exit (entry) is economically significant, but regression analyses show very small statistical significances both in the aggregate and the industry level (see Tables 7-10). Tables 7 and 8 show the regression results of entry and exit in Canada using lagged exit and entry variables, and Tables 9 and 10 show the regression results of entry and exit in the U.S. using lagged exit and entry variables, respectively. These four regressions are done to

see whether one period-lagged entry (exit) variable has significant effect on non-lagged exit (entry) variable. Regardless of the sign of the coefficient, a value close to and/or greater than 1 is considered economically significant. According to Tables 7 to 10, only the values of Canada's subsectors are found to be economically significant, and only few lagged entry or exit values out of all four tables are statistically significant. Also, not only the lagged entry or exit variables display small statistical significance, but also they absorb some significant effects of other independent variables that may affect the dependent variable (i.e. entry or exit). In this study, lagged entry (exit) does not have significant effect on lagged exit (entry).

The second set of regressions is done without the lagged entry or exit variable as one of the independent variables (refer to Tables 11-14).

Hypothesis 1: The unemployment rate has a positive effect on entry.

Many previous studies focusing on entry and using unemployment as one of the major variables had endogeneity and reverse causality problems (Santarelli et al., 2009; Sutaria and Hicks, 2004). To avoid serious econometric issues, the lagged unemployment variable is used as a determinant of entry and exit. According to Audretsch et al. (2001), higher unemployment is expected to increase entry due to increase in entrepreneurship but it also deters entry due to decrease in aggregate real GDP from decreased consumption. From the model studied in this paper, all sectoral coefficients for Canada have positive coefficients that agree with Audretsch et al. (2001) but its aggregate level and all U.S. coefficients are negative (see Tables 11 and 13). Although it is believed that many unemployed people become self-employed, they may need to own or borrow sufficient capital to start businesses which is one of the biggest barriers to entry. In reality, owning sufficient amount of money to start own business for a working-age person is rare, and when unemployed, it is difficult to borrow money from any financial institution due to low credit ratings and the high interest rate they may be offered.

In case of Canada, deterred entry from increase in unemployment rate at the aggregate level and increased entry at the sectoral level indicate that increase in unemployment rate deters entry in sectors other than the sectors analyzed in this study, such as the retail sector. In case of the U.S., increase in unemployment rate deters entry both at aggregate and sectoral levels, and

this implies that sectors analyzed in this study contribute significant portion of aggregate economy in the U.S.

Sectoral studies show that increases in unemployment affect the construction industry the most, both in Canada and the U.S. The negative coefficient for the U.S. construction industry indicates that unemployment causes low capital that deters entry and the positive coefficient for Canada implies that, compared to the U.S., Canada sees bigger potential to grow in such sector.

Hypothesis 2: The unemployment rate has a positive effect on exit.

Increasing unemployment is a signal for economic downturn, decreasing consumption and decreasing aggregate GDP (Santarelli et al., 2009). An increase in exit is expected. From the regressions results, some coefficients for Canada and all of the coefficients for the U.S. have negative signs (see Tables 12 and 14). Although increasing unemployment is expected to cause increasing exit, deterrence of exit is also possible. As companies have less workers in operation, their financial situation may become less stressful and eventually at less risk of closing the company. The unemployment rate is statistically significant in Canada and the U.S. at both aggregate and sectoral level, and coefficients of the U.S. are at least twice bigger than coefficients of Canada. Difference in magnitudes between the two countries may be due to the difference in the scale of the markets or may be due to the difference in the level of economic impact of the unemployment variable.

Hypothesis 3: Aggregate real GDP has a positive effect on entry.

Increase in aggregate real GDP means a better economy and an indication of increase in companies' profitability. Expected increases in profitability of a firm, its value, and per capita GDP encourage more entry (Parker and Robson, 2004). Referring to the results of this paper, some subsectors in Canada and all subsectors in the U.S. have positive coefficients (see Tables 11 and 13). Most of the variables are statistically significant. When entry does not increase with increase in real GDP, it may simply mean that increase in productivity of workers leads to increase in outputs which then leads to increase in aggregate GDP or increase in wages, without affecting entry or exit. Magnitudes of the coefficients for Canada are significantly larger than coefficients for the U.S. This implies that real GDP is a more critical variable that affects entry for Canada.

Hypothesis 4: Aggregate real GDP has a negative effect on exit.

Since higher aggregate real GDP is believed to bring more value to firms, fewer firms are expected to be at risk of exiting (Ilmakunnas and Topi, 1999). In contrast to the hypothesis, this study shows some positive coefficients for Canada (see Table 12). Higher GDP leading to higher exit could mean the few largest firms that take the majority share of the market are growing and making more profits while many smaller firms exit due to M&A or bankruptcy. For aggregate and all subsectors in the U.S. and the agriculture subsector in Canada, real GDP coefficients are almost zero, which implies that real GDP does not have much effect on exit. Most of the coefficients are statistically significant. Magnitudes of coefficients for Canada are much larger than coefficients for the U.S. According to Table 12 and 14, for every 1 billion dollars increase in real GDP, almost 300 firms are deterred from exiting in Canada while only 5 firms are deterred from exiting in the U.S. As in the case of entry, the effect of real GDP is larger in Canada than the U.S.

Hypothesis 5: The interest rate has an ambiguous effect on entry.

Increasing interest rate means the value of assets tomorrow will be higher than today, thus encourages entry. On the other hand, higher interest rate implies that the cost of borrowing is higher which restricts individuals from borrowing and consequently deters entry (Lewis, 2009). The overall effect of interest rate on firm entry is ambiguous. According to the empirical results from this study (see Tables 11 and 13), all of the coefficients except for aggregate level in Canada have negative signs. This indicates that many firms are risk averse in both countries. The coefficients for aggregate entry of the two countries have opposite signs, positive for Canada and negative for the U.S., and the magnitude for Canada is 30 times larger than the U.S. At the aggregate level, one percent increase in interest rate increases more than 7000 firms in Canada and deters entry of 267 firms in the U.S. This could mean that individuals in Canada are more risk neutral and optimistic about becoming entrepreneurs and are more willing to invest to have more valuable future assets. On the other hand, individuals in the U.S. are more likely risk averse so that they restrict themselves from opening new businesses when interest rate is higher. This result is opposite to the generally accepted idea that Americans are more risk taking than Canadians. This study's unexpected result may have come from the small sample size used.

Hypothesis 6: The interest rate has a positive effect on exit.

During operations, firms often borrow money from financial institutions to increase capital. The higher the interest rate, the more firms have to pay for borrowing thus the cost of operation increases and the less profit they make (Lewis, 2009). If firms make less profit, they face higher risk of exiting.

The signs of all coefficients for Canada and the U.S., except for finance sector in the U.S., are negative which contradicts with our hypothesis (see Table 12 and 14). Negative coefficients can be interpreted as firms and individuals are optimistic about rising future value of assets. These results imply that individuals at the aggregate level in Canada are risk neural in terms of both entry and exit, and existing firms in Canada do not tend to exit easily with increased interest rate. In case of the U.S., results for entry from Hypothesis 6 show that individuals are risk averse so that increasing interest rate deters entry, but results for exit show that existing firms are risk neural so that firms do not exit easily when interest rate increases.

Hypothesis 7: The economic growth rate has a positive effect on entry.

Higher economic growth means a booming economy, higher profitability, and higher rate of return. Potential entrepreneurs take an opportunity during this period to start new firms (Reynolds, 1993). All coefficients for the U.S. and aggregate level for Canada have positive signs which agree with the theory of Reynolds (1993), but all subsectors in Canada show negative coefficients that conflict with the hypothesis (refer to Tables 11 and 13). One possible explanation for the negative sign is that the contribution of economic growth in increasing wages and the rate of return on existing assets may dominate the effect on entry. In sectors study, for both countries, construction sectors are most affected and agriculture sectors are least affected by economic growth. This means that the rate of increase in the value of the assets in the construction sectors (i.e. land and building) is higher than the assets in the agriculture sectors (i.e. crops). While most of the results for the U.S. are statistically significant, results for Canada are not statistically significant. This implies that the economic growth rate is a more important determinant of entry in the U.S. than in Canada.

Hypothesis 8: The economic growth rate has a negative effect on exit.

The growing economy increases the value of existing firms and their assets, thus firms are at less risk of exiting (Reynolds, 1993). All of the coefficients for the U.S. and some subsectors for Canada have negative signs. At an aggregate level, the coefficient for Canada is positive, which contradicts our expectations. For every one percent increase in economic growth, 767 firms Canadian firms exit and almost ten thousand U.S. firms are saved from exiting (refer to Tables 12 and 14). Most of the coefficients are statistically significant and the magnitudes of the U.S. coefficients are more than ten times larger than the coefficients for Canada. This implies that firms in the U.S. are more sensitive to economic growth both at aggregate and sectoral levels.

All the independent variables used for this study are macroeconomic variables and, according to empirical results, they are all statistically significant. Since the data period for Canada is only 13 years and for the U.S. is 37 years, the studies of firm dynamics and business cycle are difficult because the results may only show short-term effects, especially for Canada. Due to the larger sample size of the U.S. data compared to Canadian data, U.S. results were more in accordance with the economic theories and hypotheses. The aggregate number of firms in the U.S. is bigger than that of Canada and this gives the overall greater magnitudes for regression coefficients. Despite this fact, the magnitudes of the coefficients tell us that the U.S. data show more sensitivity in entry and exit to movements in unemployment rate and economic growth rate and Canadian data show more sensitivity to movements in real GDP and interest rate. Overall results, especially the effect of interest rate, indicate that individuals and firms in Canada look more into future prospects, while in the U.S., individuals and firms consider more of the past and the current growth of the economy. Magnitudes of coefficients from sectoral studies show that the construction sector is most affected by all of the economic variables in terms of entry both in Canada and the U.S., but in terms of exit, each sector is affected to various levels by different economic variable.

7. Conclusion

The study of the life of firms requires large longitudinal data sets and precise time series analysis. From potential entry to the death of a firm, the life of a firm may vary from few days to

many years. Research on firms' path in the market has always been a popular topic for economists. Life of firms is largely dependent on economic shocks and market policies and regulations. During economic booms, the rate of survival of firms increases thus exit rate falls. Alternatively, during economic downturns, large fall in demand not only deters entry but also reduces incumbents' profits. A study by Perotin (2006) concludes that entry and exit are correlated with the business cycle. This implies that the life of a firm is largely dependent on the length of the business cycle.

According to Box (2008), many previous researches are more focused on microeconomic factors than macroeconomic factors. He also mentions that rather short time periods are studied and many of the studies do not cover the full business cycle, thus the results of some studies are biased.

This paper studies the effect of macroeconomic variables – real GDP, unemployment rate, economic growth rate, and the overnight bank rate – on firm entry and exit. Two countries, Canada and the U.S., and five industries in each country - manufacturing, finance, agriculture, construction, and transportation – are analyzed. The signs and magnitudes from regressions do not completely agree with the theories from the existing literature. The major limitation of this study is small sample size due to limitation of data availability.

In contrast to Johnson and Parker (1994), the results from this study do not show significant effect of entry (exit) on exit (entry). All four macroeconomic variables (i.e. independent variables) are found to be economically and statistically significant at the 1% level and this implies that these variables are important determinants of firm dynamics. Overall, the U.S. coefficients are larger in magnitudes than Canadian coefficients. The signs and the magnitudes tell us that the U.S. firms show more sensitivity to movements in unemployment and growth rate, while Canadian firms are more sensitive to real GDP and the interest rate.

Economic fluctuations in the world seem to be causing or caused by many economic shocks that either positively or negatively affect the life of firms. Although firm dynamics are necessary for industry improvements and market stability, too much turbulence in the market from high firm turnover coupled with increasing instances of negative economic shocks caused by economic instability can be very harmful for society.

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9. Appendix

Table 1. Correlation of Canadian variables.

	Entry	L.Entry	L.Unemp	L.GDP	L.Bank Rate	L.Growth	Exit	L.Exit
Entry	1.0000							
L.Entry	0.6377	1.0000						
L.Unemp	-0.3826	-0.5660	1.0000					
L.GDP	0.1927	0.4877	-0.0886	1.0000				
L.Bank Rate	0.4523	0.1283	-0.5886	-0.5539	1.0000			
L.Growth	0.0120	-0.0137	-0.2752	-0.0754	0.4070	1.0000		
Exit	0.1285	0.7199	-0.3259	0.7984	-0.3904	-0.1745	1.0000	
L.Exit	0.1229	0.2624	0.0675	0.7494	-0.5913	-0.5292	0.6173	1.0000

Table 2. Correlation of U.S. variables.

	Entry	L.Entry	L.Unemp	L.GDP	L.Bank Rate	L.Growth	Exit	L.Exit
Entry	1.0000							
L.Entry	0.6767	1.0000						
L.Unemp	-0.5835	-0.6746	1.0000					
L.GDP	0.2639	0.3032	-0.0693	1.0000				
L.Bank Rate	-0.2452	-0.2971	-0.0083	-0.7542	1.0000			
L.Growth	-0.1110	-0.2423	-0.1016	-0.7073	0.6231	1.0000		
Exit	0.4683	0.5485	-0.5273	0.6038	-0.4111	-0.5893	1.0000	
L.Exit	0.3987	0.4551	-0.3439	0.6687	-0.4859	-0.6245	0.6799	1.0000

Table 3. P-values from heteroskedasticity test (White's test and Breusch-Pagan test) for entry in Canada.

		White Test	Breusch-Pagan Test			
			Normal	RHS Normal	iid	RHS iid
Canada Entry	1	0.3738	0.6301	0.1603	0.6395	0.1862
	2	0.3738	0.2603	0.3109	0.2592	0.3081
	3	0.3738	0.4358	0.3729	0.3158	0.1136
	4	0.3738	0.3270	0.7879	0.3417	0.8090
	5	0.3738	0.6826	0.8626	0.4111	0.1748
	6	0.3738	0.2838	0.1754	0.2128	0.0656

Notes: 1=Canada, 2=Manufacture, 3=Finance, 4=Agriculture, 5=Construction, and 6=Transportation. iid stands for independently and identically distributed and RHS stands for right hand side.

Table 4. P-values from heteroskedasticity test (White's test and Breusch-Pagan test) for exit in Canada.

		White Test	Breusch-Pagan Test			
			Normal	RHS Normal	iid	RHS iid
Canada Exit	1	0.3738	0.2763	0.1890	0.4552	0.6223
	2	0.3738	0.0182	0.1612	0.0823	0.5097
	3	0.3738	0.0969	0.6110	0.0156	0.1794
	4	0.3738	0.0967	0.3817	0.2357	0.7469
	5	0.3738	0.1657	0.4792	0.3939	0.8883
	6	0.3738	0.3531	0.5354	0.3781	0.5947

Notes: 1=Canada, 2=Manufacture, 3=Finance, 4=Agriculture, 5=Construction, and 6=Transportation. iid stands for independently and identically distributed and RHS stands for right hand side.

Table 5. P-values from heteroskedasticity test (White's test and Breusch-Pagan test) for entry in the U.S.

		White Test	Breusch-Pagan Test			
			Normal	RHS Normal	iid	RHS iid
U.S. Entry	1	0.4263	0.8620	0.4326	0.8434	0.2798
	2	0.2001	0.1835	0.4102	0.1389	0.2829
	3	0.0401	0.0166	0.1255	0.0081	0.0615
	4	0.3492	0.0636	0.1895	0.0446	0.1205
	5	0.3078	0.4613	0.8949	0.3352	0.7268
	6	0.3391	0.6563	0.3871	0.6031	0.2095

Notes: 1=Canada, 2=Manufacture, 3=Finance, 4=Agriculture, 5=Construction, and 6=Transportation. iid stands for independently and identically distributed and RHS stands for right hand side.

Table 6. P-values from heteroskedasticity test (White's test and Breusch-Pagan test) for exit in the U.S.

		White Test	Breusch-Pagan Test			
			Normal	RHS Normal	iid	RHS iid
U.S. Exit	1	0.4400	0.3804	0.8807	0.3205	0.8116
	2	0.5203	0.3261	0.5256	0.3819	0.6532
	3	0.0518	0.0207	0.0278	0.0790	0.2035
	4	0.5881	0.0338	0.2707	0.2556	0.8719
	5	0.1309	0.0642	0.0581	0.0467	0.0304
	6	0.5063	0.0148	0.1924	0.0991	0.6404

Notes: 1=Canada, 2=Manufacture, 3=Finance, 4=Agriculture, 5=Construction, and 6=Transportation. iid stands for independently and identically distributed and RHS stands for right hand side.

Table 7. Ordinary least squares regression for number of entry of firms in Canada, with the lagged exit variables.

	Number of Firm Entry					
	Canada	Manufacturing	Finance	Agriculture	Construction	Transportation
L.Unemployment Rate	-9962.612 (5883.091)	3206.051 (535.308)**	947.407 (315.456)*	497.611 (231.520)	5998.776 (2735.778)	5050.306 (997.648)**
L.Real GDP	-0.416 (0.177)	0.108 (0.021)**	0.035 (0.012)*	0.024 (0.006)	0.216 (0.102)	0.189 (0.041)**
L.Interest Rate	7250.237 (1101.406)**	-350.972 (78.811)**	-249.559 (62.370)**	-406.077 (34.147)	-510.477 (604.083)	-478.519 (252.99)
L.Growth Rate	5.975 (851.277)	-272.807 (84.264)*	-123.660 (49.069)*	14.975 (47.763)	-606.705 (436.676)	-533.001 (246.306)
Time	12526.86 (5704.768)	-3295.934 (559.753)**	-869.578 (332.908)*	-620.719 (187.457)	-5439.916 (2961.55)	-4768.123 (1125.647)**
L.Exit	-0.089 (0.689)					
L.Manu_Exit		-1.081 (0.291)**				
L.Finance_Exit			-1.040 (0.449)			
L.Agri_Exit				0.764 (0.296)		
L.Cons_Exit					-0.887 (0.917)	
L.Trans_Exit						-1.480 (0.783)
Constant	715378.3 (332086)	-144940.4 (29467.1)**	-42278.1 (17056.37)*	-31873.19 (10158.43)	-281784.7 (148178.1)	-254409.5 (56078.21)**
N	13	13	13	13	13	13

Notes: Standard errors in bracket are estimated with Newey-West estimator. * refers to a significance level of 5% and ** refers to a significance level of 1%.

Table 8. Ordinary least squares regression for number of exit of firms in Canada, with the lagged entry variables.

	Number of Firm Exit					
	Canada	Manufacturing	Finance	Agriculture	Construction	Transportation
L.Unemployment Rate	-5399.232 (4039.148)	-78.244 (162.363)	-893.034 (199.606)**	145.525 (130.724)	-2029.213 (283.094)**	788.658 (155.429)**
L.Real GDP	-0.099 (0.121)	0.008 (0.006)	-0.024 (0.007)*	0.010 (0.004)	-0.040 (0.011)**	0.052 (0.004)**
L.Interest Rate	-1406.9 (709.078)	-177.251 (41.308)**	-76.368 (46.179)	-66.482 (25.730)*	-369.236 (80.747)**	-364.941 (48.784)**
L.Growth Rate	212.511 (338.050)	-30.010 (17.834)	73.892 (28.537)*	11.435 (15.727	145.264 (61.692)	-233.173 (24.151)**
Time	3120.336 (3462.554)	-395.879 (188.730)	719.895 (206.970)	-508.684 (120.734)**	1363.691 (293.464)**	-1371.735 (107.938)**
L.Entry	0.270 (0.139)					
L.Manu_Entry		0.095 (0.069)				
L.Finance_Entry			-0.065 (0.063)			
L.Agri_Entry				-0.073 (0.079)		
L.Cons_Entry					0.110 (0.058)	
L.Trans_Entry						0.059 (0.021)*
Constant	245809.7 (194764.7)	-3441.797 (8597.088)	39857.57 (10438.8)**	-4231.016 (5660.74)	76196.81 (14752.38)**	-63086.3 (6130.943)**
N	13	13	13	13	13	13

Notes: Standard errors in bracket are estimated with Newey-West estimator. * refers to a significance level of 5% and ** refers to a significance level of 1%.

Table 9. Ordinary least squares regression for number of entry of firms in the U.S., with the lagged exit variables.

	Number of Firm Entry					
	U.S.	Manufacturing	Finance	Agriculture	Construction	Transportation
L.Unemployment Rate	-19631.83 (5050.152)**	-1016.627 (46.002)**	-4389.531 (705.786)**	-351.370 (65.692)**	-5687.703 (482.384)**	-1650.528 (224.513)**
L.Real GDP	-0.011 (0.029)	-0.004 (0.001)**	0.004 (0.007)	0.0002 (0.001)	-0.018 (0.001)**	-0.004 (0.001)**
L.Interest Rate	-221.739 (2933.38)	-6.504 (85.311)	-575.281 (510.342)	-42.007 (56.460)	-2206.315 (219.006)**	67.192 (128.506)
L.Growth Rate	9419.404 (3235.418)**	660.924 (88.841)**	242.627 (638.254)	136.947 (47.639)**	2842.224 (219.761)**	564.038 (337.102)
Time	4806.547 (9150.701)	501.424 (338.184)	-347.010 (2013.685)	172.135 (260.861)	3660.535 (248.396)**	1502.287 (202.878)**
L.Exit	0.1685 (0.1506)					
L.Manu_Exit		0.274 (0.082)**				
L.Finance_Exit			-0.028 (0.234)			
L.Agri_Exit				0.010 (0.095)		
L.Cons_Exit					0.312 (0.091)**	
L.Trans_Exit						0.397 (0.053)**
Constant	714239.1 (66086.71)**	54086.88 (3622.938)**	70965.01 (18114.2)**	8688.394 (3231.228)*	213130.3 (9820.735)**	47925.88 (4757.528)**
N	37	37	37	37	37	37

Notes: Standard errors in bracket are estimated with Newey-West estimator. * refers to a significance level of 5% and ** refers to a significance level of 1%.

Table 10. Ordinary least squares regression for number of exit of firms in the U.S., with the lagged entry variables.

	Number of Firm Exit					
	U.S.	Manufacturing	Finance	Agriculture	Construction	Transportation
L.Unemployment Rate	-22036.05 (5639.486)**	-1749.482 (625.936)**	-1785.23 (550.630)**	-198.603 (85.924)*	-2778.306 (1830.986)	-650.523 (239.001)*
L.Real GDP	-0.005 (0.010)	-0.003 (0.001)**	0.004 (0.002)	0.002 (0.0001)**	0.003 (0.004)	0.001 (0.001)
L.Interest Rate	-496.375 (802.721)	-137.809 (75.858)	410.864 (102.827)**	-69.740 (13.448)**	269.925 (354.212)	52.310 (99.083)
L.Growth Rate	-9622.571 (2295.762)**	-750 (185.778)	-898.417 (555.494)	-215.960 (63.349)**	-2808.336 (628.623)**	-418.578 (181.084)*
Time	3936.95 (3097.837)	386.530 (200.247)**	-419.763 (655.962)	-194.646 (32.203)**	-1075.934 (1041.472)	-72.053 (177.119)
L.Entry	0.062 (0.142)					
L.Manu_Entry		0.100 (0.237)				
L.Finance_Entry			0.173 (0.086)			
L.Agri_Entry				-0.046 (0.096)		
L.Cons_Entry					0.292 (0.208)	
L.Trans_Entry						0.627 (0.061)**
Constant	705965.1 (113902)**	61832.13 (18677.96)**	21323.43 (5390.735)**	469.203 (1469.079)	54672.77 (48010.61)	5688.498 (7097.761)
N	37	37	37	37	37	37

Notes: Standard errors in bracket are estimated with Newey-West estimator. * refers to a significance level of 5% and ** refers to a significance level of 1%.

Table 11. Ordinary least squares regression for number of entry of firms in Canada, without the lagged exit variables.

	Number of Firm Entry					
	Canada	Manufacturing	Finance	Agriculture	Construction	Transportation
L.Unemployment Rate	-9332.874 (2005.876)**	2535.982 (719.548)**	1228.384 (327.708)**	647.540 (260.324)*	5808.189 (2745.287)	3787.041 (1615.891)
L.Real GDP	-0.394 (0.075)**	0.089 (0.027)*	0.048 (0.012)**	0.030 (0.007)**	0.213 (0.101)	0.132 (0.059)
L.Interest Rate	7165.292 (716.544)**	-421.876 (91.638)**	-181.595 (68.360)*	-367.040 (24.146)**	-827.905 (375.584)	-252.971 (202.617)
L.Growth Rate	57.770 (482.479)	-112.037 (97.307)	-116.349 (38.579)*	-60.411 (52.338)	-306.608 (357.593)	-70.164 (239.419)
Time	11849.79 (2232.248)**	-2588.511 (726.494)**	-1280.091 (332.462)**	-968.585 (199.326)**	-5772.078 (2773.441)	-3300.912 (1619.021)
Constant	673951.1 (102874.6)**	-122462.6 (37684.9)*	-64082.75 (16720.94)**	-34655.22 (10449.53)*	-286869.3 (143346.3)	-185795.8 (84390.81)
N	13	13	13	13	13	13

Notes: Standard errors in bracket are estimated with Newey-West estimator. * refers to a significance level of 5% and ** refers to a significance level of 1%.

Table 12. Ordinary least squares regression for number of exit of firms in Canada, without the lagged entry variables.

	Number of Firm Exit					
	Canada	Manufacturing	Finance	Agriculture	Construction	Transportation
L.Unemployment Rate	-12841.03 (1167.968)**	159.973 (60.664)*	-939.261 (183.802)**	58.530 (58.132)	-1472.64 (379.875)**	1016.39 (133.507)**
L.Real GDP	-0.297 (0.039)**	0.016 (0.002)**	-0.026 (0.007)**	0.007 (0.002)*	-0.019 (0.014)	0.061 (0.004)**
L.Interest Rate	-878.542 (440.749)	-182.762 (35.386)**	-82.587 (42.311)	-48.446 (32.586)	-333.622 (65.548)**	-363.885 (42.730)**
L.Growth Rate	767.161 (233.260)*	-50.861 (11.341)**	79.815 (21.912)**	20.115 (7.900)*	73.549 (64.150)	-265.122 (16.615)**
Time	8639.646 (1157.079)**	-632.490 (73.278)**	763.658 (192.518)**	-421.312 (60.641)**	822.161 (378.566)	-1595.725 (116.752)**
Constant	579527.1 (55156.66)**	-14846.95 (3407.705)**	42175.73 (9629.3)**	-682.843 (2957.288)	47823.72 (19390.62)*	-75416.96 (5794.237)**
N	13	13	13	13	13	13

Notes: Standard errors in bracket are estimated with Newey-West estimator. * refers to a significance level of 5% and ** refers to a significance level of 1%.

Table 13. Ordinary least squares regression for number of entry of firms in the U.S., without the lagged exit variables.

	Number of Firm Entry					
	U.S.	Manufacturing	Finance	Agriculture	Construction	Transportation
L.Unemployment Rate	-20971.77 (4050.591)**	-1367.368 (95.801)**	-4351.838 (622.409)**	-350.951 (62.092)**	-6613.544 (728.594)**	-2314.222 (322.010)**
L.Real GDP	-0.011 (0.029)	-0.004 (0.001)**	0.004 (0.006)	0.0002 (0.001)	-0.019 (0.001)**	-0.004 (0.001)**
L.Interest Rate	-267.657 (3127.51)	-27.085 (138.362)	-578.132 (514.107)	-43.354 (53.057)	-2122.514 (78.050)**	-6.334 (66.955)
L.Growth Rate	8376.331 (2922.39)**	575.135 (129.401)**	282.669 (472.744)	134.646 (46.465)**	2052.255 (258.696)**	407.508 (218.466)
Time	5342.97 (9698.602)	634.847 (455.097)	-334.760 (1908.957)	169.275 (252.814)	3805.435 (397.043)**	1655.369 (319.628)**
Constant	821562 (74797.6)**	70746.38 (4517.431)**	70187.7 (19690.13)**	8672.397 (3122.648)**	246359.7 (7043.782)**	61402.32 (2965.895)**
N	37	37	37	37	37	37

Notes: Standard errors in bracket are estimated with Newey-West estimator. * refers to a significance level of 5% and ** refers to a significance level of 1%.

Table 14. Ordinary least squares regression for number of exit of firms in the U.S., without the lagged entry variables.

	Number of Firm Exit					
	U.S.	Manufacturing	Finance	Agriculture	Construction	Transportation
L.Unemployment Rate	-23756.76 (2331.219)**	-1940.846 (223.281)**	-2567.893 (387.976)**	-175.731 (51.834)**	-5302.977 (314.508)**	-2345.165 (476.007)**
L.Real GDP	-0.004 (0.010)	-0.003 (0.001)**	-0.005 (0.003)	0.001 (0.0001)**	-0.001 (0.001)	-0.001 (0.001)
L.Interest Rate	-839.224 (1219.122)	-147.801 (63.188)*	346.405 (113.945)**	-66.979 (10.243)**	-233.734 (522.134)	-173.108 (108.729)
L.Growth Rate	-9797.005 (1935.133)**	-766.816 (153.933)**	-996.301 (512.501)	-213.705 (59.995)**	-2651.614 (421.132)**	-569.905 (222.419)*
Time	3649.325 (3166.875)	440.241 (257.173)	-632.809 (908.269)	-198.801 (26.288)**	-292.541 (565.674)	596.706 (261.164)*
Constant	759024.9 (48670.57)**	69571.33 (3725.702)**	30626.53 (8349.338)**	47.771 (812.498)	125171 (5546.482)**	45036.42 (6250.785)**
N	37	37	37	37	37	37

Notes: Standard errors in bracket are estimated with Newey-West estimator. * refers to a significance level of 5% and ** refers to a significance level of 1%.